

FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

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EDITORIAL COMMENT.

"The Peril of the Air."

Our appeal of last week has not been barren, if we may judge by the vigorous articles on the need for national supremacy in aeronautics that have appeared these last few days in the general Press. Moreover, an unforeseen ally has come forth in shining armour from the pages of the current issue of the *Review of Reviews*, which publishes a striking illustration of this country's singular slackness and makes very clear for the least discerning eye to see how far England is already under the shadow of the evening wing.

It is laid to the credit of the late Mr. W. T. Stead, a progressive born, that he raised five millions for the Navy when the senior service was far short of its present efficiency. Had he been alive to-day he would have rejoiced to fight for the good cause of an adequate British aerial fleet. The journal that he founded and so ably conducted is acting accordingly.

We hope it will be with equally beneficial results, for indeed it is a situation that calls for the utmost effort not from one quarter only but from all. It is a fight that the Press must fight, because the issue is in the hands of the public and public opinion is moulded by the Press.

It is useless, as we have often enough pointed out, for the interested technical element comprising the industry and its allies to badger the Government without public recognition and support. As a race we lack enthusiasm for new things and the type of daily journalism that fetches the most ready market is that having for its *motif* an ineffective abuse of the authorities whose position deprives them of the power of reply.

It is no wonder if the public mind is filled with gall or that individual ministers should make no special effort to advance the cause of that for which only a small minority profess themselves in favour.

It is the public who must demand the supremacy of Britain in the air and it is the public who must pay the cost. The Press at large is responsible for making the people of England realise their position. To merely demand that that should be done for which there is no money available is a futile thing. The army estimates under which comes the aeronautics vote leaves no surplus out of which to build up the new arm of defence on a scale adequate to the nation's needs. The Royal Flying Corps is not the Air Battalion, it is a Service in itself. Men from the Navy, men from the Army, and men direct from civil life enter the Central Flying School at Upavon, which is neither naval, military nor civil—but belongs to the Royal Flying Corps.

Until a civilian has passed through the school he does not know whether he will be attached to the military or the naval wings of the R.F.C. and whether he is attached to the one or to the other he is neither a soldier nor a sailor but just an officer of the Royal Flying Corps—and it is honour enough. And the Royal Flying Corps of the British Nation is expected to establish itself and keep itself on a vote of £300,000 or thereabouts, which was its allowance last year. The thing would be ludicrous if it were not so serious.

At the opening of the Aero Show on Friday the Chancellor of the Duchy of Lancaster gave expression to that most poisonous of all dogmas, which applauds idleness and apathy on the pretence that it is considered patience. May be, we do save our money by letting other people do this work, but it has been said by wiser men than ourselves that *experience* is a pearl of great price, and we have yet to hear of this, save of the kind that is both unexpected and undesired, being bought by idleness and apathy. We venture to suggest to Mr. Hobhouse and others of his opinion that the

wholesome reflection of what they personally might feel if suddenly called upon to make good in any one of the numerous departments of the world's work in which they have received no training. Would they be inspired, we wonder, by the progress of recent years and deem it no advantage to feed their simple brains on the complexity of modern science.

Why, the cry of the age is specialisation, and the

problem of the hour is how best to fit the next generation for its work. Waste the first few years of education and the youth is handicapped throughout the race. So will it be with the nation. Sit we still now and watch France and Germany make their splendid failures with a smug air of superior aloofness and we may learn to sit on a stool not so much to our liking some other day.

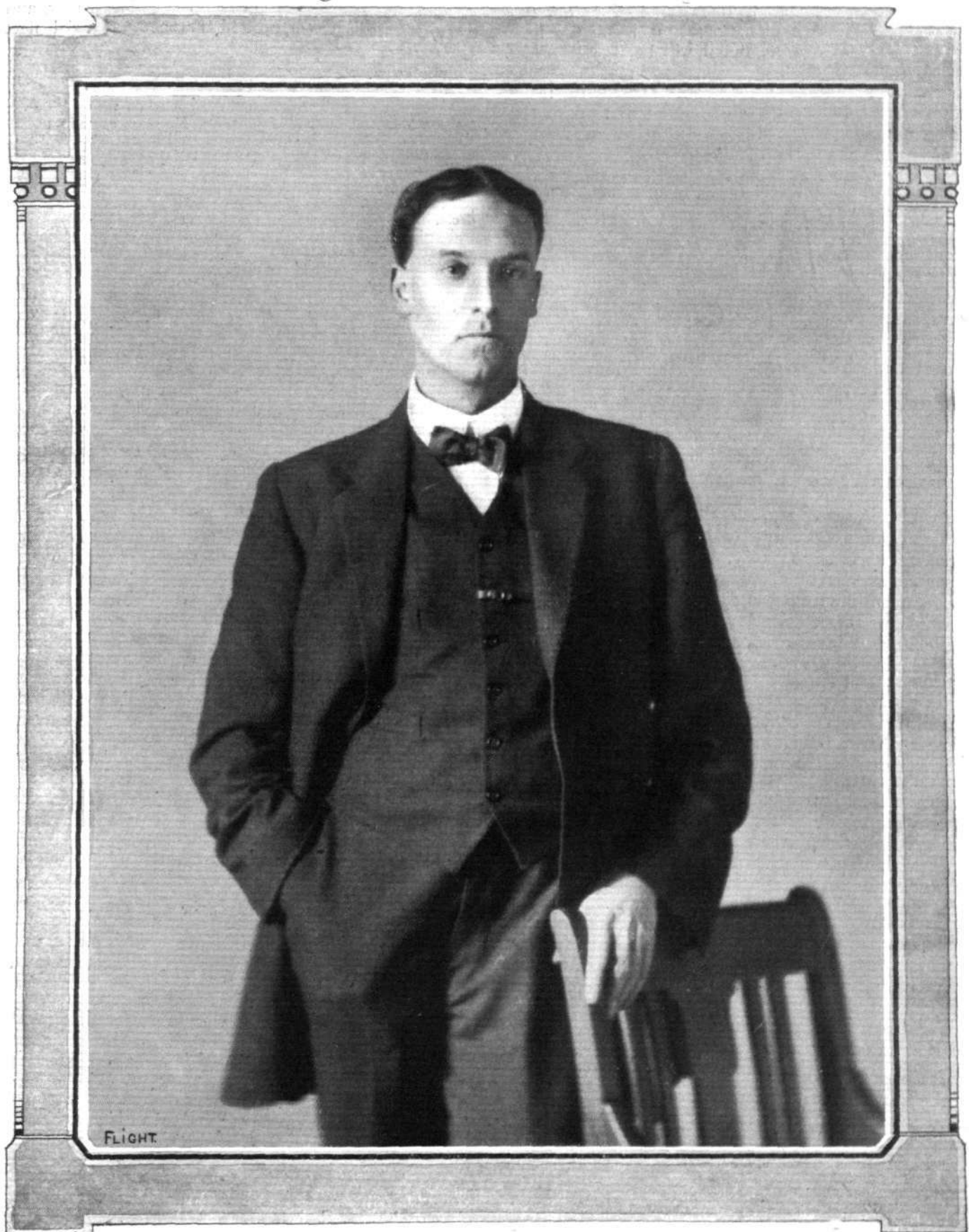


The "Review of Reviews" Map of England, showing the Distances between Heligoland and Cologne and many of the Vital Centres open to Aircraft Attack, upon our Coasts

FEBRUARY 22, 1913.

FLIGHT

**MEN OF MOMENT IN THE WORLD OF FLIGHT.
Pioneer Pilot-Constructors.**



MR. G. DE HAVILLAND.

Some Plain Speaking.

The article in the *Review of Reviews* to which we have already referred, and in connection with which we reproduce on page 206 a very graphic argument in the form of one of the pictures which appear in that publication, gives much food for reflection on the present aerial position of nations. It is far too long for us to quote *in extenso*, but it will be useful for the purposes of the argument which we ourselves have addressed to the Government and the people on many occasions if we quote some of the more striking passages. Dealing with the present position, the article says:—

"At Heligoland, Kiel, Cuxhaven, Wilhelmshaven, Dusseldorf, Frankfurt and Cologne are housed German air warships, any one of which is capable of arriving over this country within seven hours, without any warning, without any possibility of interruption, and with the freest possible hand with regard to potential destruction. It is interesting to know that whereas Germany has concentrated eight airship stations in face of our new strategic frontier, she has only thought it necessary to have one air-camp on the Russian frontier, one near the Austrian frontier, and three or four on the French frontier. If Germany's naval increase is sufficient to change the entire strategic plans of the British Government, even although it is loudly proclaimed that the German fleet is really no serious menace to British naval supremacy, it is time for this extraordinary concentration of the German aerial force, against which we can pit nothing, to receive the earnest attention of British Ministers. If they any longer neglect their duty towards the nation, they will be betraying the future of this country in the most cold-blooded and unpardonable fashion. In the past the mistakes of Ministers have been retrieved and this country has muddled through; but with regard to a possible attack from the air there will be no possibility of muddling through, and the disorganised and panic-stricken survivors of the population of London will have the sole, although sorry, satisfaction, before passing under German domination, of hanging the guilty Ministers."

These are weighty words indeed, and that they do not exaggerate the situation there is only too much reason to know. Sorry satisfaction indeed if our only prospect is to ornament the lamp-posts of Whitehall with Ministers of the Crown *after* the damage is done. Better by far that they should bow to the necessity of the moment by providing adequately for the establishment and expansion of our present air forces.

Now is the time, as Orville Wright said to a representative of the *Daily Mail* during his visit to Olympia on Tuesday: "The show proves that here you have the workmanship and the brains for the construction of a magnificent aerial fleet. If your Government is considering any such scheme I may say that from what I have seen to-day, now would be the time to give the orders, for you have the material at hand."

Other nations have realised that the time is at hand long since for them, and that they have the manufacturers willing and able to do their part. Thus, let us quote again from the *Review of Reviews* on this point of the utility of the airship in war:—

"Hitherto the public has understood that airships may be of some service for obtaining information. Within a twelvemonth it will realise that they are to be instruments of the most dreadful character for effecting destruction. Surely even the lay mind will realise what can be done by an airship with an independent speed of 45 miles an hour, a range of action of several hundred miles without alighting for replenishment of supplies, and capable of lifting guns and ammunition, not by the hundredweight, but by the ton! During recent practice a small canvas float was set adrift on Lake Constance. From an airship about $3\frac{1}{2}$ miles away, and circling in the air at an altitude of about 3,000 ft., a gunner got the exact range with his third shot, which was fired only a few seconds after the first. The target was quickly riddled, and though the exact results were kept secret by official order of the German Government it is known that the percentage of hits was close to 100. Manœuvring in fairly brisk winds did not make it impossible for the gunners to get perfect range. Again, the Z III while at practice, manœuvring at battle speed at a height of 6,000 ft., shot to pieces in 17 mins. the target, a silhouette of a whole village arranged on the manœuvring grounds

several miles out of Badeux. Equally successful results have been obtained at the artillery grounds at Juterbog and the aerial school at Metz."

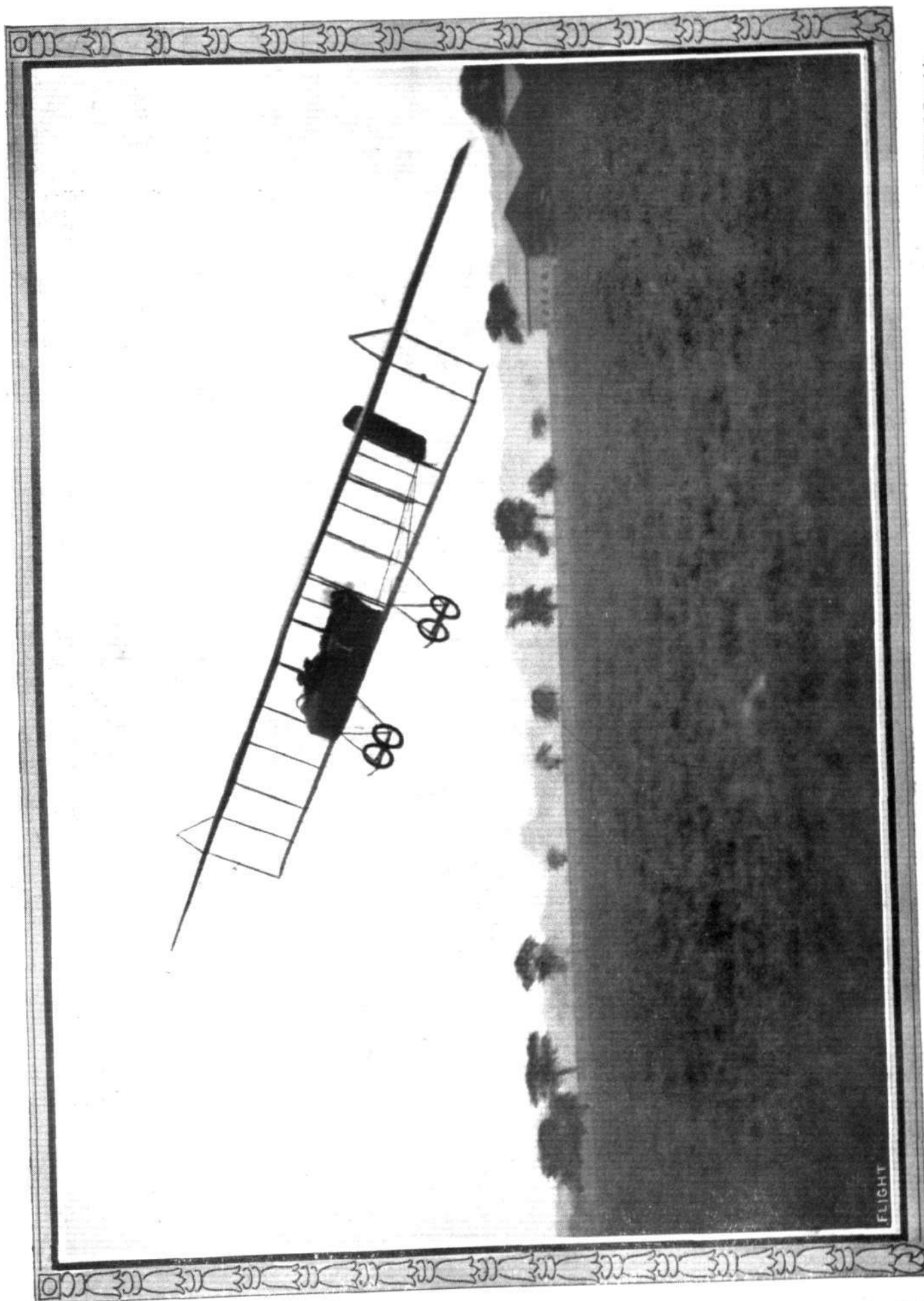
Assuming all this to be true, is it not well that we, a Great Power, should at least be equally to the fore. The present international tension is no laughing matter, and compared with Germany and France our aerial fleet simply does not exist.

"Turning to England, where the safety—and, indeed, the very existence—of our Empire may in the near future depend upon the efficiency and strength of our aerial fleet, what do we find? After years of talk, and bushels of promises, Ministers are still trifling with the nation in this important matter of defence. On April 12th of last year, it was officially stated that twenty-five aeroplanes were on order for the Army. Nine months have elapsed, and in that period Col. Seely has added exactly one aeroplane. And yet it is possible for a prominent War Office official to make the following declaration: 'I think and believe that, even with all our mistakes and omissions, we have laid the foundation of a plan which will ensure that this country in the long run, and sooner rather than later, shall be able to hold her place in the air as she has done in the centuries past both on land and sea.'"

The simple truth of the matter is that the English people have not awaked to a realisation of the true significance of the conquest of the air. The Government should have done so independently, but instead of taking on its own shoulders the responsibility of immediate and rapid expansion it economised and has thereby caused most serious, even vital, delay. Now, the people must speak, the Press must speak, and Members of Parliament must see to it that the next grant for aeronautics is to be at least a million.

Army Requirements in Aeroplane Engines.

We draw particular attention to a letter in our Correspondence columns written by Mr. Mervyn O'Gorman, Superintendent of the Royal Aircraft Factory. He has written in order to correct a misapprehension that he has heard is prevalent as to the conditions that have to be satisfied before the authorities will consider the purchase of engines for use on the R.F.C. machines. As there are several constructors now engaged in the perfecting of new designs it would be well that they should read Mr. O'Gorman's letter with care, and in any case it is surely the best plan for anyone in that position who happens to be in doubt to make some sort of direct effort to find out what is essential and what merely desirable from the Royal Flying Corps standpoint. It is perfectly obvious that R.F.C. aeroplanes ought to be equipped with British-built engines, and we have always supposed, and indeed Mr. O'Gorman's letter makes clear, that the precise attainments of other motors are not regarded as a *sine qua non*, although they may be used as a standard of comparison. It is desirable of course that, other things being equal, an engine should approximate to a weight not much exceeding 3 lbs. per h.p. It is equally desirable that it should be able to run for twenty-four hours, and that it should provide for a propeller speed in the neighbourhood of 900 to 1,200 r.p.m. These things are desirable, no doubt, and we mention numerical values that will have occurred to anyone who has even superficially studied the present situation. We should be sorry to think, however, that a variation in any particular from what is at present usual would prejudice the chances of success of an otherwise good engine, and we feel sure that British constructors should in no wise be discouraged from pushing forward their designs from any misapprehension that the authorities have a preconceived notion of precisely what is essential and will consider nothing else.



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A fine bit of banking by Mr. Claude Grahame-White on the Henry Farman at Hendon Aerodrome.

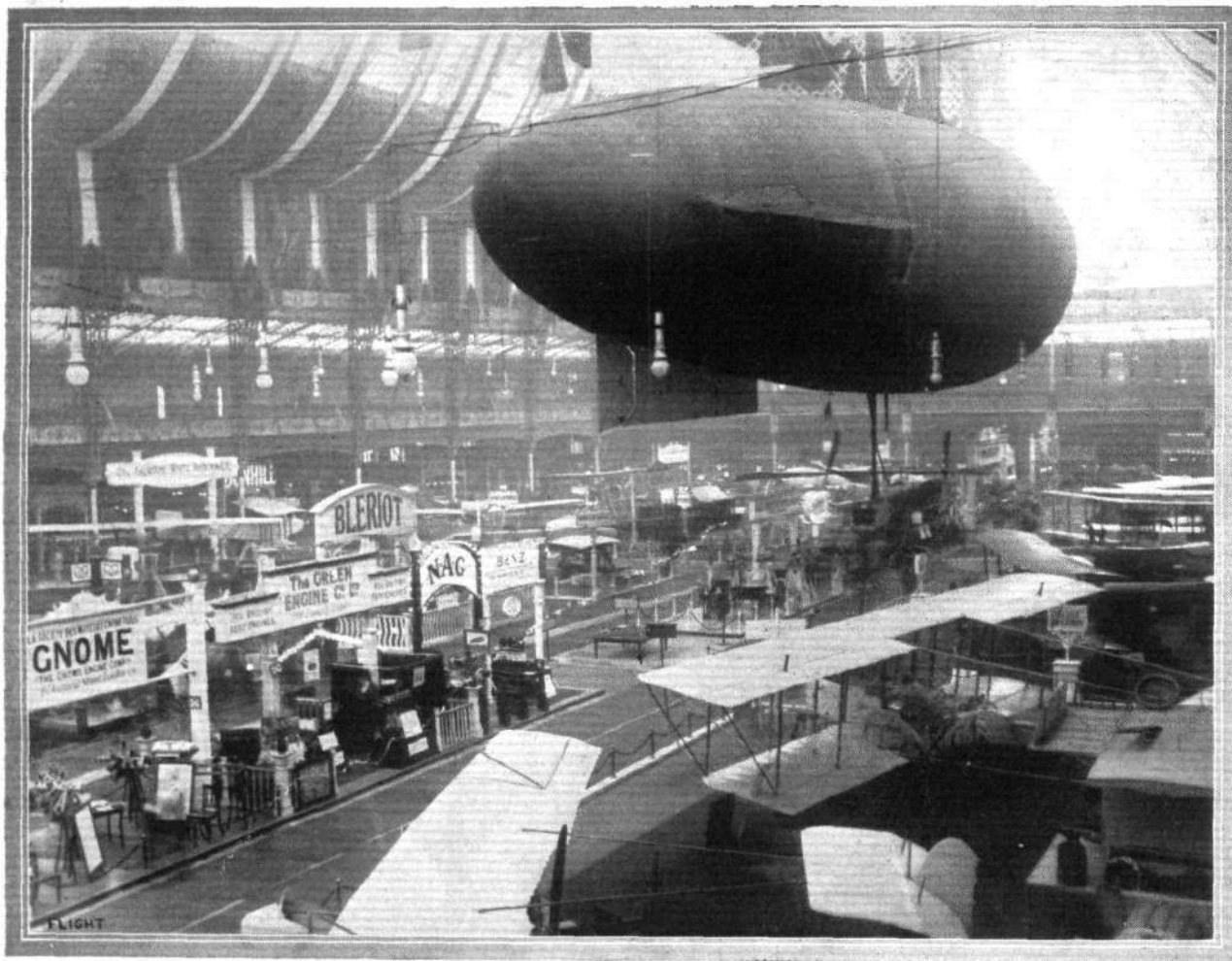


THE OLYMPIA

FIRST IMPRESSIONS.

FIRST impressions are not always best, but often they are the most lasting in spite of their faults. I do not think, however, that there will be any need at any time to change my opinion that the "Fourth International Aero Exhibition, organised by the Society of Motor Manufacturers and Traders with the assistance of the Royal Aero Club" was—well, shall we say, worthy of its full and sonorous title. There would be so little point in saying that it is the most interesting show that ever was, because the first aero show was unquestionably that in its day, so was the second and the third, and so again is this, the fourth, as a matter of course. Only, that

into the vortex of constructional detail. One thing especially was thus apparent, the high standard of excellence in respect to the workmanlike appearance of all the machines. Whatever the public may think about the prospects of flying as a popular pastime—and in principle I should like to see the visitors animated with that same purpose of purchasing as entices them through the turnstiles to the motor show in November—they can find no excuse for lack of confidence in the well-finished appearance of the machines themselves. On that score there can be no question but that those engaged in the industry have realised the serious purpose on which they are



General view of the Aero Show at Olympia.

particular phase of its interest is, in a large measure, due to the proximity of those earlier pictures already present in the mind's eye.

Those who attended the first show will recollect the variety of talent expressing such a versatility of mind as should have given us by this time half a dozen effective modes of taking our airings in the sky. By the time the second show was open, pioneer constructors had more or less made up their minds that the aeroplane was the vehicle of the air with which to do business, whatever might be its shortcomings in their own estimation. And now, after an interval of two years from the third show, we witness an exhibition in which there is no question as to the aeroplane being regarded as the proper and only form of flying machine for practical use.

Walking round the stands with the detached air appropriate to the unaccustomed dignity of a silk hat, donned in honour of his Majesty's presence in the vicinity, it was possible to assimilate something more of the predominating spirit of the modern movement in design than might have resulted from an immediate plunge

intent and have put heart and soul into making their machines as safe as they know how.

It is always a healthy sign when an industrial exhibition marks the official debut of a new phase. At Olympia, the hydro-aeroplane makes its first British public appearance before those who do not so far follow the movement as to be aware of its existence in practical flying. Its popularity dates from last spring, when the French made a great display on the occasion of the Monaco motor boat meeting. It was seen that mishaps occurring over water were less liable to result fatally on those concerned and it was of course recognised that the "water plane" or "bat boat" as it is variously called by that arch-christener of new things, the *Daily Mail*, was a *sine qua non* for the Navy. Since then the development has been very marked and the present show would be of outstanding interest for that feature alone.

It was a clergyman, the Rev. C. M. Ramus, who first suggested the hydroplane, in 1872, and he drew the attention of the Lords of the

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Admiralty to his experiments and their results. Unfortunately, the point of view from which the project was approached was that of building war ships on the hydroplane principle, which, being out of the question, the scheme as a whole was abandoned. It did not seem to occur to the authorities that the idea might be both feasible and useful on a small scale, but Sir John Thornycroft recognised its possibilities and conducted a great many experiments on the subject. Some few years ago the development of motor boat racing brought forth the hydroplane as the craft *par excellence* for giving phenomenal speeds. As built in France at that time the hydroplane was a crude, raft-like affair, having little or no virtue beyond its high velocity. The occasion seemed ripe, however, for Sir John Thornycroft to materialise his early experience with models on a larger scale, and the first hydroplane boat was accordingly produced at Chiswick.

To have referred thus to what is by way of being historical, and more particularly concerned with the motor boat at that, is not wholly irrelevant to the matter in hand, inasmuch as the waterplane exhibited by the Sopwith Aviation Co. is in fact fitted with a hydroplane hull built on motor boat line, the famous Saunders

main floats in conjunction with floats under the tail and under the wing tips, the latter being for use in emergency if the aeroplane is blown over by a gust while on the water. There is a strong opinion on the part of some designers, notably Messrs. Short Bros., who have had considerable experience building hydro-aeroplanes for the Navy, that the single main float is inadequate for practical purposes, and that only by the use of two floats can a sufficient width of supporting base be rendered available.

Thus, the hydro-aeroplanes at Olympia divide themselves fundamentally into two categories according as to whether they have one main float or two. The supplementary division, which may include types of either main category, involves the principle of carrying the entire weight on the main floats, as distinct from part thereon and part also on a tail float. Thus, the Sopwith carries all the weight on its single boat, while the hydro-aeroplane built by Messrs. Samuel White and Co., of East Cowes, to the design of Mr. Howard T. Wright, is similarly supported on two main hydroplane floats. The Sopwith boat has but one step, whereas the White floats have three each. Many of the floats shown have no step at all, but they are generally shorter in length.



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The British-built Deperdussin war hydro-aeroplane.

"Maple Leaf" serving as the model in this case. Moreover, the matter has this much more of general interest in that there is a marked difference in type between the hydroplane attachments at present in use, and it is important to consider their relative merits. Thus there could be nothing further removed from the Sopwith hydro-aeroplane, which accommodates the pilot and the passenger in the boat itself, and the hydro-aeroplanes that are supported on large box-like floats that have not the faintest resemblance to a boat.

The original Ramus design of 1872 was essentially a flat-bottomed boat with a step half way along the bottom, so that the floor formed two inclined planes in tandem. It was shown by Sir John Thornycroft in his early experiments to be very important to have a sharp rectangular edge on the step, and to finish off the stern of the boat in the same way. If the floor of the stern is rounded up to the water line, the stern wave clings to the hull and sucks the stern down into the water, thus making the bows rise unduly and preventing the boat taking to the surface at the proper speed. The steps and the square stern break down this suction effect and are essential to a hydroplane boat—moreover, the longer the boat, the more numerous are the steps.

On some of the hydro-aeroplanes at the show the floats are short and broad like large boxes and they have no step on that account, but their stern edge is noticeably sharp. Such machines use their

The introduction of the hydro-aeroplane is of extraordinary interest from many points of view, and not least from the standpoint of general design. Thus in the Sopwith machine the pilot and passenger sit side by side in the boat, and the engine is between the planes just over their heads. As the whole of the machine is behind them they have much the same range of forward vision as they would have were it not there at all. On other types the disposition of pilot and passenger is much as in usual aeroplane practice, although some adjustment is doubtless made in the centre line of the propeller shaft and general balance in order to compensate for the extra weight and resistance of the floats. It is much to be hoped that model tests will be carried out to provide accurate information about the resistance of such things when in flight, and whether or no the lift of their inclined flat bottom is as significant as some people think.

It cannot be said that the Aero Show is over-crowded with exhibitors, but it is well representative, and it includes a welcome new comer in the well-known shipbuilding firm of J. Samuel White and Co., of East Cowes. For their design of hydro-biplane, Mr. Howard T. Wright is responsible, and it includes one of the most startling details in the whole of Olympia. The last thing that one expects is a radical departure in the section of the main planes, but Mr. Wright has devised a new profile that he states, on the authority of M. Eiffel, to have given very remarkable results.

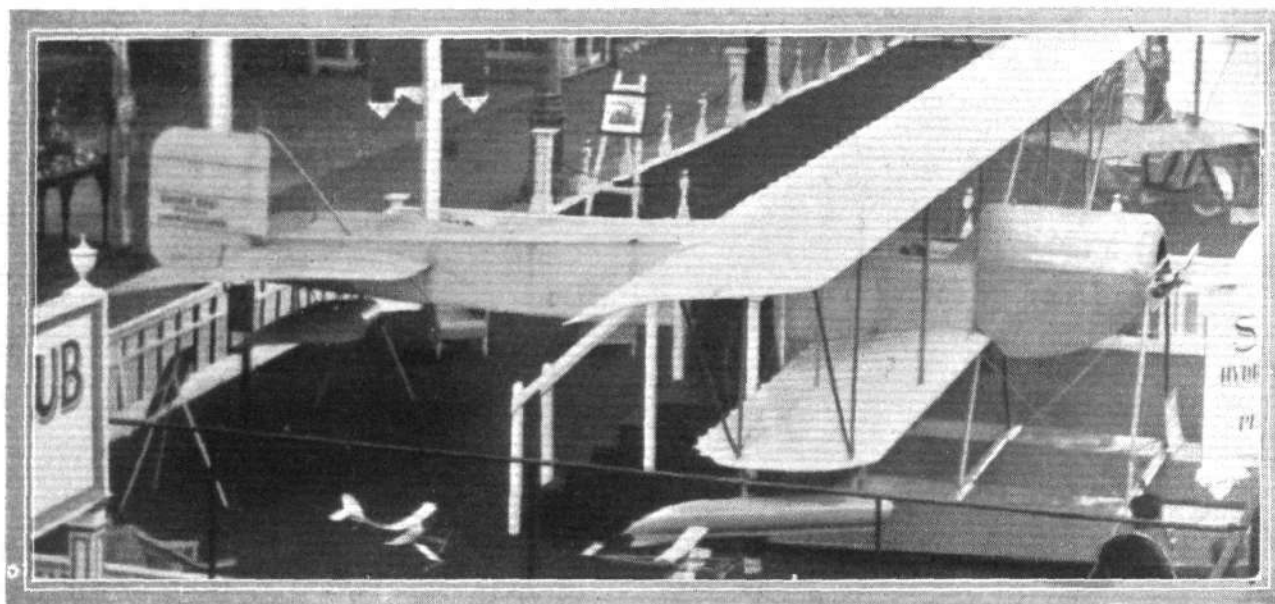
It consists of a single curvature for the lower surface and two arches in tandem for the upper surface. In fine, it is somewhat like two wings of half the full chord placed one behind the other so that their under sides form one continuous surface. The rest of the machine by comparison may be said to be orthodox, but it is beautifully built and it is a pleasure to discuss its detail with one who has every fact and figure at his finger tips as has its designer.

One other departure of striking interest and first-class importance that should attract others than those concerned with aviation to Olympia is the new Wolseley engine. In this motor Mr. McCormack, the Company's general manager, has incorporated an invention of his own by which the exhaust valves only are water cooled. The rest of the cylinder is air cooled, but the general design of the engine is the same as that of the water-cooled motor that this firm introduced some time ago. Already the tests of the new combination have given most encouraging results, and if the scheme is as successful as is at the moment foreshadowed, there should be a very big future for the type. The system is worked out in a very neat way, and apparently in such a manner as fully serves its purpose. By water cooling the exhaust valves, the seat of the greatest intensity of heat is brought into line with the remainder of the air-cooled cylinder walls, and it is hoped that the combination may result in a very light and highly reliable engine.

should preferably be altogether absent. In a new Grahame-White military biplane means for fitting a large central chain-driven propeller behind the main planes has been devised by carrying one of the tail outrigger booms through the hollow propeller boss.

There is not the least tendency to follow the lonely furrow ploughed by the Wrights, who use two screws on their machines, yet the system has much to be said in its favour, and might fit in well with the design of a real military aeroplane. The recognition for the need for a clear fighting deck is gaining ground, however, and a remarkable outcome of this influence is the latest British-built Deperdussin monoplane, which has no top staying for its wings. Instead, the wings are trussed in both directions by a supplementary boom on a lower level, so that the structure is in itself a biplane although it has but one pair of supporting surfaces.

From the advantage that might accrue from the additional surface, on this spar that is now bare, it is not without interest to consider the possible although unpremeditated evolution of the present machine on biplane lines. With its extra pair of wings the propeller and the engine might be lowered, and if two screws were used aft of the wings, the pilot and observer might sit further forward and so have a remarkable all-round view. By placing the pilot on a lower level and leaving the observer with a free outlook



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The Short hydro-aeroplane.

While these features seem to stand out as matters of prominent interest in the Show, they are by no means all that is worthy of inspection. Not a stand, in fact, could one pass without pausing to appreciate one point or another. In one corner was Cody's biplane which won the Military Trials; next door to it was the Vickers Stand, where a staggered plane biplane attracted attention. Built of tubular steel, the staggered disposition of the struts, by which the upper main plane was thrown forwards, was similarly extended to the struts in the tail outrigger.

In this machine, as in the Henry Farman and in the Sopwith hydroplane, the tail is carried on an outrigger of V-plan form, so that a single propeller can be driven behind the main planes. This enables the pilot and passenger to be accommodated in a body that projects forwards into a position that gives them an unrestricted outlook and freedom to use a gun.

This latter is of the greatest importance, for it has been rendered abundantly clear that the fighting aeroplane as distinct from the high speed scout is regarded as a necessity by those who regard flying from the military point of view. In the absence of the aerial destroyer, therefore, military aviation in England is not likely to progress at the pace most of those engaged in the industry so heartily desire. A fighting aeroplane essentially implies the possession of a gun, and the possession of a gun just as certainly implies the possession of a wide shooting range. It is the more necessary to provide adequate range for the use of the gun in the first instance, inasmuch as the machine itself may not necessarily be so easily brought into the precise position required for an effective shot within a limited angle. Besides, the relative speeds are so great in the air as to make it all-important to give the gunner every possible latitude. In design, this consideration affects the use of superstructure forward of the main planes and elevator gears in this position

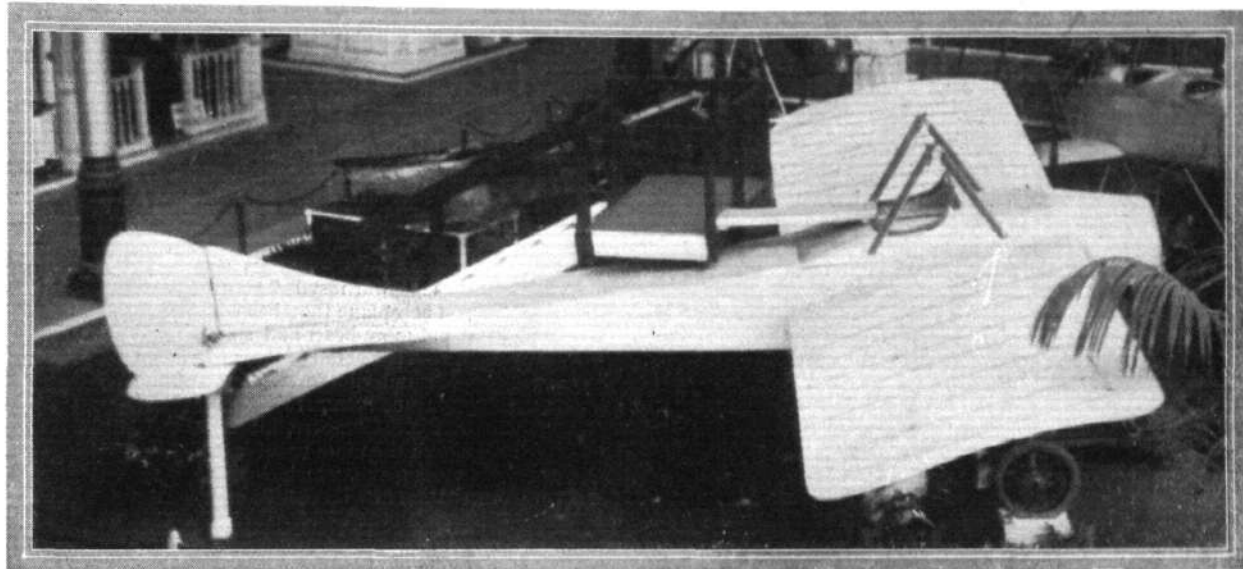
and a gun, something even more nearly approaching military requirements than anything yet built might conceivably be planned.

In the discussions that now and again range round the subject of biplane *v.* monoplane, I have never before cited what is in some respect an important argumentative consideration. In principle, the aeroplane flies like a bird inasmuch as the wings support the weight by their edge on motion. But, nature has the great advantage of being able to make a good job of a reciprocating joint, and so uses the supporting surface for propulsion by flapping it. Man finds the revolving shaft preferable for mechanical reasons, and so uses a propeller. The propeller, however, is far from a convenience on an aeroplane, for it introduces a new vertical dimension that cannot be evaded. Even if efficient wings could be built so as to be entirely supported by internal bracing, there would still remain the propeller to define the height of the under-carriage, and, whilst that height is necessary, there is something to be said for making use of it by the addition of another pair of wings. Indeed, from the standpoint of the propeller being a necessary evil, the biplane might be regarded as an attempt to bind an internally braced supporting element. Not having been viewed in this light, it is not surprising that no one should have seen fit to give the observer the benefit of a position overlooking the clear top deck, across which he might use a gun in any direction.

The question of using brakes on aeroplane under-carriages is one that has been raised often enough, and visitors to Olympia will have an opportunity of inspecting an ingenious arrangement on the Bristol biplane by which the machine is not only retarded but steered by the brakes. It is carried out in the well-finished style that characterises the British and Colonial Aeroplane Co.'s methods, which have already won for the Bristol aeroplanes a deservedly world-wide reputation. The Bristol monoplane, I notice, has some-

what larger wings, and is said to be two hundred pounds lighter than when flown in the Military Trials. Its trailing edge construction is most interesting, a strip of thin ply wood being used as a stiffener. A notable characteristic of this machine is the extent of the warp, the wing tip being capable of being moved through a distance of about three feet. As the ribs are free to rock on the tubular steel spars, the warp does not spring the internal structure

such a way as to make longitudinal stability a problem apart then the matter to be settled is whether the stability is to be of the "compass" or "weathercock" order. That is to say, whether the axis of the machine is to remain horizontal always or whether it is to tilt and dip with the trend of the wind. In the article in question, sensitive weathercock longitudinal stability was regarded as necessary to the realisation of lateral stability, and the argument



The Vickers war monoplane.

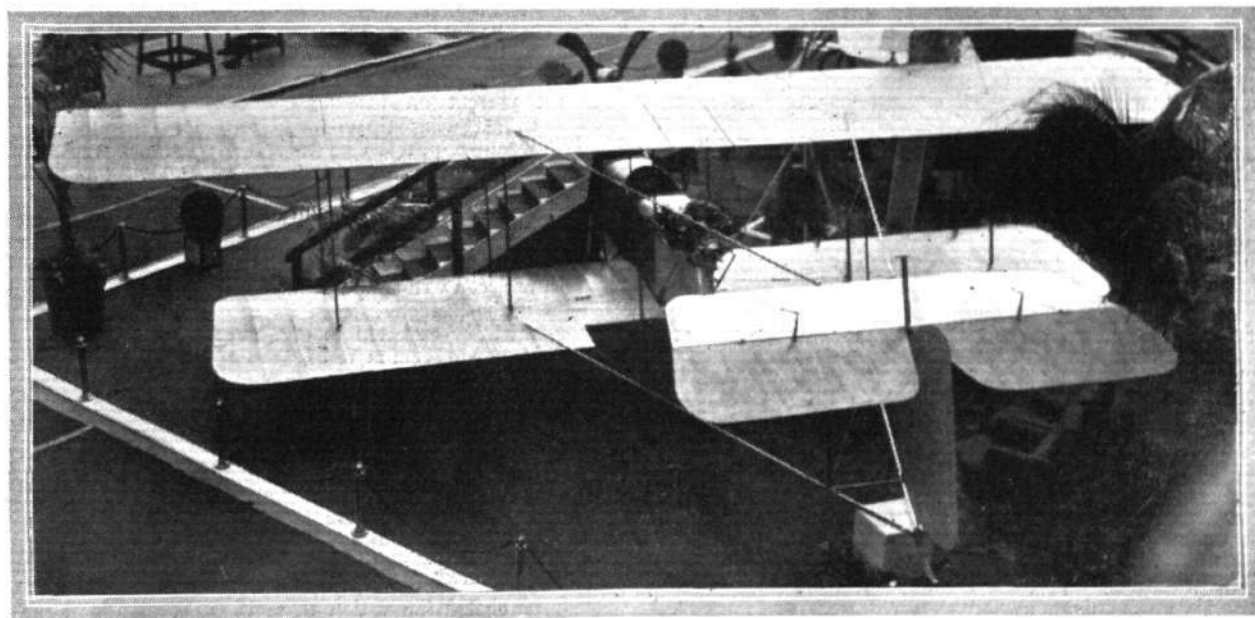
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so much as usual, and the tip when warped tends to remain where it is put.

Passing the Aircraft Co.'s stand, on which are those two masterly designs by Henry and Maurice Farman, which, by the way, seem to be monopolising a good share of the Army orders, I was attracted by two side shows, one the Eteve speed indicator and the other the Roneophone. Of these the former is a simple pressure plate coupled up to a pointer moving over a quadrant scale. On the

has this much claim to interest that, when analysed, all modern machines are built to provide "weathercock" longitudinal stability, although not necessarily in a very sensitive degree.

The fore-and-aft dihedral is a device to this end. If the angle of incidence to the relative wind exceeds the ordinary, the c.p. of the system travels towards the rear, and the axis dips weathercockwise into the wind—*vice versa*, when the angle of incidence becomes too fine. The result is automatic speed maintenance



The Vickers biplane.

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middle of the scale is a red line, and the idea is to fit one on to a strut and to fly with the needle always on the line or as near thereto as may be. Henry Farman himself, says Mr. Holt Thomas, never flies without such a device, and contends that no pilot can judge of the relative air speed by his mere experience.

This is more interesting than appears on the surface, for the problem of speed maintenance is fundamental to the subject of longitudinal stability. If as has been suggested in the recent "Thoughts on Stability and Control," the stability problem, so far as it is a definable problem at all, is divisible in

for at any given angle of incidence the relative air speed required for support is a fixed quantity.

It might well be argued, therefore, of what use is an air-speed indicator on such a system; or, rather, what causes it to assume the importance that makes a pioneer like Henry Farman regard its use as imperative. The answer, to my mind is simply that the modern desire for variable *horizontal* speed has led to a tendency to abuse the elevator, which in its proper function is a device for damping out oscillations and for the initiation of special manoeuvres, but has since become the means whereby the machine is held in some other

than the normal attitude in order that it may fly *horizontally* at some other than its normal speed.

In so far as the speed range indicates reserve power, it provides a quality that is second to none among the things fundamental to safety in flying, but there are other ways of demonstrating reserve power than by variable horizontal speed. The disadvantage of this practice is that pilots may be tempted to use the elevator to force the machine to maintain horizontal flight when the engine is not pulling properly, thus using up their reserve power on the mere act of flying, and leaving none for the manoeuvres of turning and ascent. It is, I think, largely because of the habit of using the elevator in the capacity of a gear-box that there is so great a demand for the extended use of the air-speed indicator which tells a pilot when he is departing from his normal relative velocity.

The Roneophone, also on the Aircraft Company's stand, is a small disc phonograph designed to take the place of the observer's notebook by enabling him to record his observations by speaking directly into the machine. It is a well-thought-out device, and may prove to be of great importance in military use. In any case it would be worth while that the army should experiment with something of this sort.

The problem of communication between pilot and passenger is also one of some difficulty, and it is in such matters that exhibits like that of the General Aviation Contractors assumes a particular interest. On this stand is every kind of device for the flyer, including two gorgeous fur suits with the fur on the outside, which are reminiscent of the early French automobile salons. The price of these habiliments is not marked, but anyone who ventured to Brooklands or Hendon in the outfit, that now graces a wax model, would surely never have reason to complain of an unprofitable purchase.

But there are other technical and more serious things on this stand, the Kelvin compass for instance, and the well-known instruments of Hue. Although, as one walks round the "outer circle" at Olympia, one is not necessarily impressed by the number of accessory exhibitors, the list of names is long enough to be surprising. Thus, for example, here is the Cellon dope, that excellent varnish with which fabric is rendered weatherproof. At Dunhill's there are helmets to fit every size of brain. Navalium is a new aluminium alloy of which previously I have never heard, but there is also Duralumin, the material invented by Messrs. Vickers, which is being tried for many things. Hoyt metal is present as a suggestion for those whose engine bearings are unsatisfactory. Messrs. Mallison and also Messrs. Owen show timber, and seeing that most aeroplanes are still wooden built there should be some profit in dealing in this substance. Wakefield's oil and Price's oil speak for themselves as lubricants, and likewise the Sternal exhibit of the same nature. A fascinating stand is Melhuish's where the tools are shown; what a field day one could have with a workshop where every conceivable thing is to hand as it is at the exhibition. Most of the working hours would be spent in selecting the most appropriate instrument. There is a new Primus stove on view which should interest those who cook meals in their hangars, but I am compelled to ask why does not someone put on the market a first-class petrol-fired kettle boiler for motorists and perhaps for flyers, so that one might prepare the cheering cup by the wayside by burning half-a-pint or so of the fuel already in the tank.

Dover's have a non-inflammable Exonite that is transparent and should be helpful as a wind-screen when it is ready to come on the market. It stands to reason that the aeroplane of the future must afford its passengers protection from the weather just as does the modern car, but there may well be some advantage in avoiding glass, and the preference for a non-inflammable material over ordinary celluloid is undoubted. When the aeroplane comes to this stage the lamps shown by Messrs. Lucas will be of more general importance than at present, but even now night flying at Hendon renders the illuminated aeroplane an attractive necessity on some occasions, although it is at present rather the electrician who provides this side of the picture.

While air-cooled engines hold the field radiators find a narrow market, but the Motor Radiator Co. and Spiral Tube Co. stay manfully in the field, and will probably reap a big reward some day, for while the air-cooled engine serves its purpose well enough at present, it is very far from being a foregone conclusion that it will satisfy future conditions equally well. Bolts, nuts, pressings and the like such as are shown by Messrs. Rubery, Owen are always in demand, and Bowden wire controls, now used mainly for working throttle-levers, might well find an extended field of service. "Rubberoid for the Roof" is an alliterative title that might be adopted by the proprietors of a high-class compound that is exhibited as a covering for hangars.

On the Strand of Aeros, Ltd., is a collection of everything useful, and for variety of attraction it is difficult to withdraw one's attention from the exhibits of Messrs. S. Smith and Son, the world-famous watchmakers of the Strand, who now also specialise in revolution indi-

cators and such like instruments. Of propellers there are plenty, but to choose the best is far from easy. The Normale has to its special credit the speed record of Vedrines and the circuit of Britain by Beaumont. The Chauviere Integrale is exhibited in water to emphasise the enduring quality of an impervious glue. On the Garuda stand is a monster two-bladed screw designed for 200-h.p. Propellers used for hydro-aeroplanes are mostly brass-tipped, to protect them against damage if they strike the water.

Among the firms who exhibit under the gallery are Messrs. Hewlett and Blondeau, but they are far from being merely dealers in accessory fittings. Their constructive ability is well known, and, their workmanship has earned them a reputation that cannot but help be a sound foundation for an extensive business. Their interest to those who desire to have a machine built to their own design is direct, for not only is the firm in a position to execute such orders in first-class style, but their equipment is in many ways able to save the customer much of the expense that ordinarily attends the carrying out of an order for a trial machine.

Speaking of workmanship, there is no doubt that the Exhibition excels in that feature, for there is no machine present that is unworthy of its place. For neatness and good finish it would be difficult to beat the "Martinsyde" monoplane, which is also perhaps the most graceful aeroplane that has ever taken the air. Certainly no constructors put more heart and soul into the thoroughness with which they carry out the detail of their work. Although in principle so much alike, it is indeed a fascinating study to wander round the stands at Olympia and compare even so much as the superficial differences in design. Compare, for instance, the Martinsyde king-post wing truss with the more usual multi-wire system as exemplified on the Blériot monoplane, which, by the way, is the seven hundred and twenty-seventh of its line! Then compare the Breguet flexible wing attachment with the Caudron partially-flexible wing. Remarkable little machines these Caudrons; it would be most interesting to know the results of tests on models of their wings, as it would, indeed, for other wing sections in the Show. In the absence of a "graph" it is impossible to bring one's appreciation to a point.

In the British section the Avro biplane stands out as a thoroughly straightforward job that should do credit to this most persevering of firms. They have had some experience of waterplane building for the Admiralty of late, but the machine shown has a land chassis. It is more commonly regarded as usual for waterplanes to belong to the biplane class of machine, but two water monoplanes from France should be noted in the presence of the Nieuport and the Borel.

Another firm, which, like Messrs. A. V. Roe, was in at the beginning and is again an exhibitor is Messrs. Handley Page. Moreover, the Handley Page monoplane of to-day retains the distinguishing characteristic of its prototypes, which is probably more than can be said for any other pioneer constructor in the Show. From the first, Mr. Handley Page believed in the virtues of the upturned wing tip and crescent entry, which wing form is still present on his modern monoplane. The theory of the upturned wing tip of the kind used on the H.P. monoplane would appear to be that set forth by Mr. E. H. Harper in his recent paper to the Aeronautical Society. The upturned tip in this case projects a virtual fin some distance in front of and above the propeller, which fin, in conjunction with the tail fin and rudder, constitute the lateral stability organs of the system. The nature of the stability of such a system is analogous to that of dihedral wings, which project a virtual fin at some height above their shoulder, but differs in the characteristics of its action. Thus, whereas dihedral wings might be expected to give a quick recovery, the upturned wing tips would seem more likely to promote a low period roll.

It would be interesting to know to what extent the wing tips on the Handley Page monoplane are negative in the sense of being subjected to downward pressure, and also to what extent the general flow of the relative wind across the wing as a whole is diagonally outwards, as it is suggested is the case by Mr. Handley Page. On the White hydro-biplane, designed by Mr. Howard T. Wright, by the way, subsidiary negative (down pressure) planes in the gap are used for balancing purposes.

Down the central aisle is a first-class show of aero motors that is worthy of far more than casual notice. Apart from the Wolsley air-water cooled innovation there is much that is of the greatest interest in the engines that are already in service. The new 100-h.p. 6-cyl. Green, for example, is a fine looking machine that should appeal to those who are seeking to introduce the stationary type of motor into their aeroplane designs. Someone was saying to me the other day that he disagreed with the point of view that places the rapid progress of practical flying largely to the credit of the Gnome. It may be true, but it is somewhat special pleading to argue that in its absence the success of the aeroplane was equally well assured, inasmuch as sheer necessity would have forced a satisfactory solution. The fact remains, however, that the Gnome came to hand at the psychological moment and made good. It is now represented in England by a

separate company and its latest development is a starting handle whereby it can be put in action from the pilot's seat. How soon, I wonder, will the picture of the mechanic swinging the propeller be a relic of the past and photographs of the operation be exhibited in a glass case on the stand of the Aeronautical Society.

Another foreign engine is the Renault, and the 12-cyl. 100-h.p. model is the special show-piece on their stand. Two motors from abroad that will hardly escape notice are the N.A.G. and the Benz, both prize winners in the German Emperor's recent competition. The Mercedes, another prize-winner too, is another engine from Germany that should attract attention.

The Austro-Daimler is already famous in England for its victory in the Military Trials on the Cody biplane. It is present at the Show not on that machine *only* but also on the big four-seated Grahame-White military machine.

There is but one other example of the rotary engine in the Show besides the Gnome, and that is the Clerget, which has for its chief feature the use of mechanically operated inlet valves. In the Gnome

engine, as is well known, the mixture enters the cylinder through an atmospheric valve in the piston head. There are, however, two stationary radial motors on view, one the well-known Anzani, exhibited by the General Aviation Contractors, which is the standard engine fitted to the British Dep., and the other is the Salmon or Canton-Unne system, for which the makers of the Breguet biplanes appear to have a preference.

With respect to any or all of these motors, what is most to be desired is the publication of the results of an authenticated bench test such as any who wish can very readily have carried out at the Royal Aircraft Factory, and which has the additional merit of being more than likely to lead to good business if the results are successful.

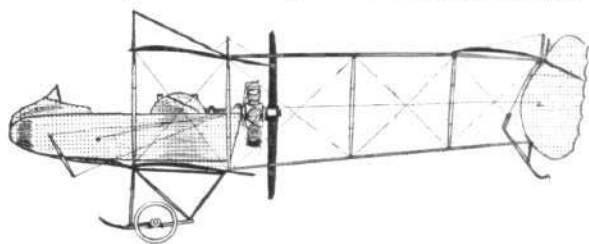
Having mentioned several things on the Aircraft Company's stand that are not in themselves aeroplanes, I will conclude with a reference to the transport service wagon which is shown there. It is a motor vehicle equipped as a repair shop, and draws attention to the sort of thing that is part and parcel of the properly developed aerial forces.

OISEAU GRIS.

SOME MORE AEROPLANES AT OLYMPIA.

THE AIRCRAFT MANUFACTURING CO., LTD.

In our last issue of FLIGHT we described and gave sketches of the 70-h.p. Maurice Farman biplane shown on their stand. At the time of going to press with that issue the 80-h.p. Henry Farman machine that they are also showing was not available for review, so it

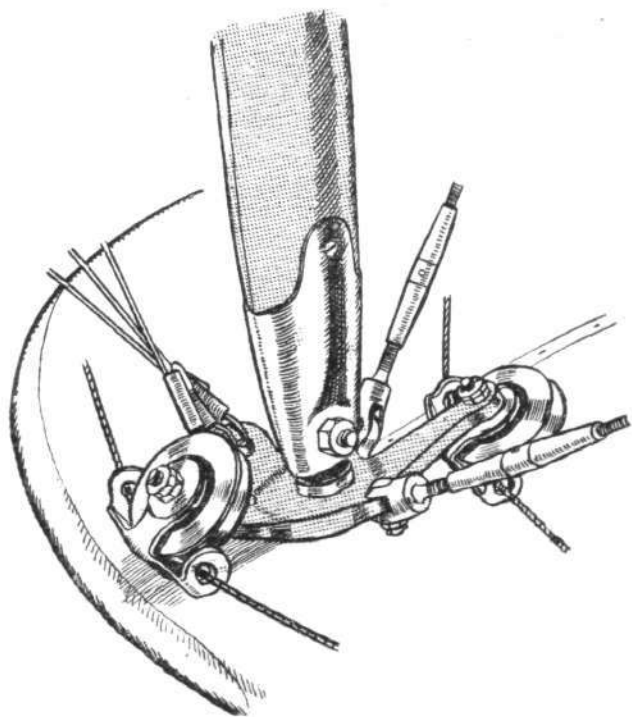


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The 80-h.p. Henry Farman biplane.

could not be included in the report of the Aircraft Manufacturing Co.'s stand. Since then, however, we have been able to examine the machine, and we are able to set forth its chief characteristics here below.

The 80-h.p. Henry Farman Biplane.—Remembering the comparative crudity of construction of these machines some three years or so back, the excellence of the workmanship that the Farman firm put into their machines now is a revelation. And

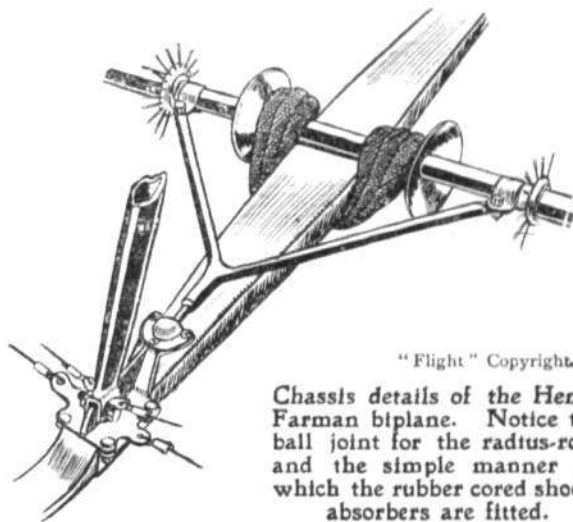


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Plane strut fitting, showing the warping wire pulleys on the H. Farman biplane.

perhaps it is not surprising, since they have, at Billancourt, what are probably the best organised and largest aeroplane works in the world. The machine at Olympia on the stand is an ordinary everyday sample of their good work. It has been taken from stock, to use a rather inaccurate expression, since the demand for these machines is so great that they can keep no stock.

Plane construction.—Its planes span 45 ft. and 25 ft. respectively, their chord measurement is 5 ft. in the centre bay, from which they taper to the tips. They are separated by struts 4 ft. 9 ins. in length. There are twelve of these struts separating the two planes, half of them being of hollow ash, and the remaining ones of hollow spruce, the ash ones being those immediately on either side of the engine, and the four that brace the *cellule* above the point of attachment of the landing gear. The spars, both front and rear,



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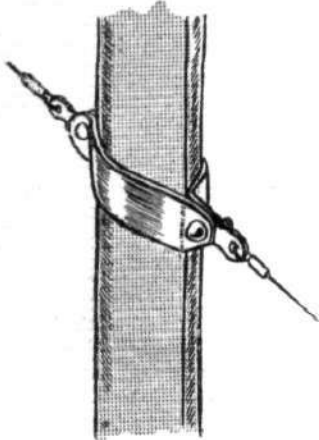
Chassis details of the Henry Farman biplane. Notice the ball joint for the radius-rods and the simple manner in which the rubber cored shock-absorbers are fitted.

are of ash, and the front one is bullet nosed, as it forms the entering edge of the plane. The 10 ft. extensions that are fitted to the top plane on either side of the machine are braced in position by king posts and piano wire in a manner identical to that of a monoplane wing. Double acting ailerons, for balancing, are hinged to the rear spars of these extensions.

The landing chassis.—The ordinary type of Farman chassis is employed, but in its working out there are many detail improvements. The two short ash skids are spaced 9 ft. 9 ins. apart, and each support the machine through a single rank of three steel tubular struts on either side. There is a sketch printed in connection with this description which shows the neat manner in which the radius rods are universally hinged to the skid by a ball joint. In former types of the Farman under-carriage, steel compression springs were fitted over the axles between the central bobbin carrying the shock absorbers, and the wheel hub, to assist the chassis to track correctly. These have been dispensed with now, and the elastic cord which provides a flexible suspension of the wheels, is now bound under the skids and over the axles.

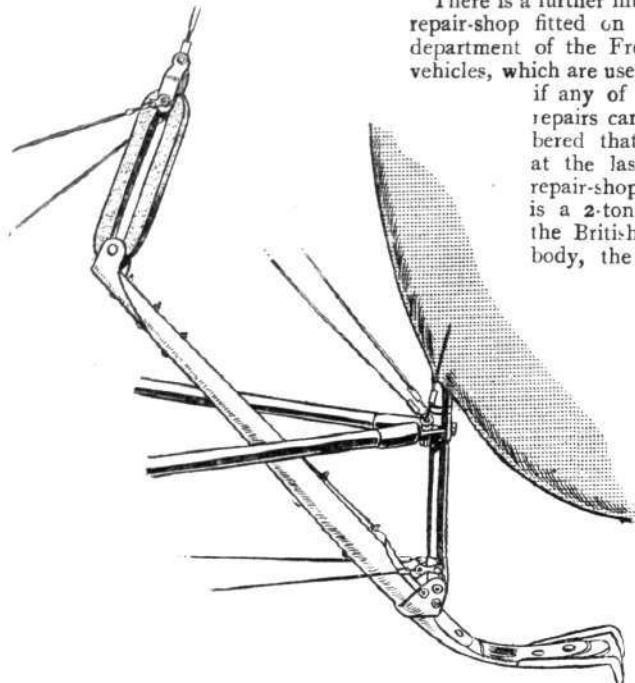
The body, a rectangular section girder, built up with ash *longerons* and ash cross-members, accommodates the pilot and passenger in tandem, and serves as a mounting for the motor and tanks. Its sides and bottom are enclosed, and a wind shield in front assists in

keeping some of the draught off the occupants. This front is constructed in rather a neat manner. The skeleton of that portion is of oval section steel tubing, and the vertical members separating the top and bottom sweeps are of the same material. The joints are acetylene welded. Just behind the wind shield there is a very comfortable seat, with a high back of sheet aluminium for the pilot. He controls the rear elevator and the compensating ailerons by means of a vertical universally jointed lever, greatly refined from the crude form of lever that was employed on the early Henry Farman biplanes. The passenger has a seat, perhaps not quite so com-



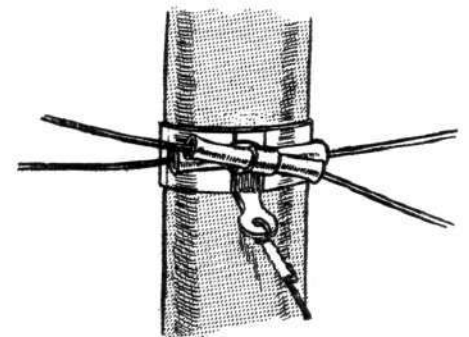
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How oblique stay wires are carried past struts on the H. Farman biplane.



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The Henry Farman tail-skid.



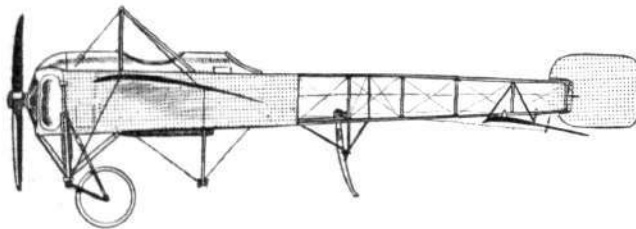
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How the tail control wires are guided at the side of a strut on the Henry Farman biplane.

fortable, just behind the pilot. The Gnome motor, at the back, is overhung. It is mounted with two flanged steel plates on one side of the crank case, and the fuselage in that vicinity is cross-braced by $\frac{3}{8}$ -in. steel tubing, to give it the necessary rigidity and strength. By the way, a new type of carburettor is fitted, whereby the engine may be made to run slowly, a condition which is difficult to obtain with the ordinary type of Gnome injector carburettor.

down and rest on exterior supports to give greater floor space, are a complete set of machine tools, sufficient (may be, more than sufficient) for the accomplishment of aeroplane repairs "on the road." There are installed a drilling machine and a Drummond lathe, both electrically driven by motors which obtain their current from a dynamo driven off the engine shaft. An anvil, a forge, and a convenient bench with a useful-sized vice are also carried.

L. BLÉRIOT.

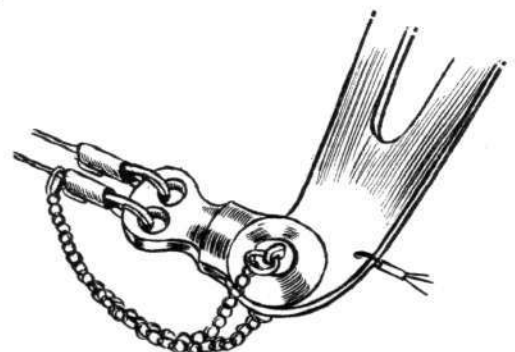
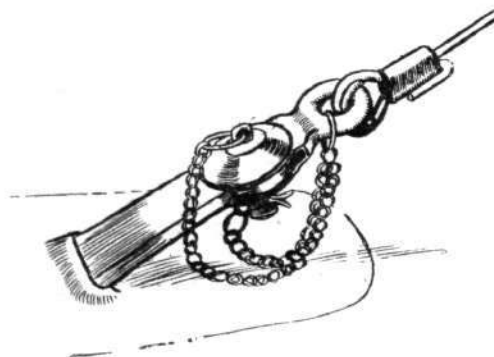


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The 80-h.p. Blériot tandem monoplane.

A very fine sample of an 80-h.p. Two-seater Blériot Monoplane is exhibited on their stand. To all intents and purposes the machine may be described as a 50-h.p. Gnome single-seater Blériot, enlarged up and provided with accommodation to carry a passenger. It has, as well, some few detail alterations that are not present in the 50-h.p. model. Some thirty of these machines are at the present time being put through the Blériot works at Levallois Perret, for delivery to foreign governments and private customers.

The body.—The chief point of difference that the body has, as compared with the 70-h.p. two-seater Blériot flown in this country by Hucks, is that the tail skid is sprung from the lower member of the fuselage instead of the upper. This change has been made on



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DETAILS OF THE BLÉRIOT MONOPLANE.—The sketch on the left shows the method of strengthening the bottom cross-plank of the landing chassis and the application of stranded cable. The middle sketch shows the upper wing stay-wire attachment. That on the right illustrates how the double control-wires are fastened to the rudder lever.

account of its having been found that the old method of springing was inclined to put too much strain on the body framework. The passenger, who sits behind the pilot, has a perfect view below the machine, for his seat is arranged about 2 ft. behind the trailing edges of the wings, while these latter are cut away on either side of the body so as to further improve the view. It may not be generally thought so, but it is nevertheless a fact, the accuracy of which is vouched for by one who has on many occasions flown as a passenger on one of these machines, that the occupant behind obtains quite a good view, as well, over the top of the wings. A seat is provided for the pilot well forward in the body, in such a position that he can practically look down vertically over the leading edge. In front of him, beneath the motor cowl, the tanks are mounted; the oil tank on the left, that for petrol on the right. There is also an auxiliary petrol tank arranged behind the pilot, which feeds the petrol to the service tank in front, under pressure provided by a small hand pump on the right of the pilot. Among the various instruments in front of him is a new mechanical engine speed indicator, of Blériot design. This is a very important improvement, as hitherto Blériot has fitted most of his machines with an electric speed indicator which cannot be said to have always proved as reliable as it should be. The classical form of Blériot *cloche* control is fitted to this machine. It will be remembered that in our last issue we gave particulars of a new 80-h.p. Blériot military monoplane in which the *cloche* control had been suppressed, and its place taken by a vertical hand wheel, mounted on a rocking column. We have heard that the alteration of the control on this latter machine has merely been done by way of

experiment. The *cloche* has proved itself to be such a convenient form of control that Blériot will probably never depart from it.

The wings span 31 feet, and have a supporting area of 198 sq. ft. In their construction I-section ash spars are used, the ribs of spruce being also of the same section, but built up. They are braced on the underside by two stranded steel cables to each front spar, and by heavy gauge piano wire to each rear spar.

All the cable attachments are designed so that they may be dismantled quickly without interfering with the adjustments. As an illustration of this, we might mention that the machine shown at Olympia came direct from Paris, where it was erected and trued up before being dismantled, packed and dispatched. On its arrival at Olympia, the wings were assembled, the tail unit bolted in its place, and the whole machine got into flying trim without touching a single adjustment, by two Blériot pilots, Mr. Robert Slack and M. Turod to wit, in under half an hour. And it must be remembered that the circumstances were such that there was no necessity for them to put themselves about to get the operation completed in record time.

The landing gear is of the usual Blériot type, with the innovation that now there is fitted a stranded steel cable along the edges of the bottom chassis plank. This cable has been fitted to help take the tension in this bottom plank that is caused by the wing stay cables being fitted to either end of it. There is an improvement also in the design of the spindle of the landing wheels, so that these latter may be readily detachable. By taking out one split pin the spindle may be unscrewed from the bearings on either side of the wheel, and quickly removed, allowing the wheel to drop free.

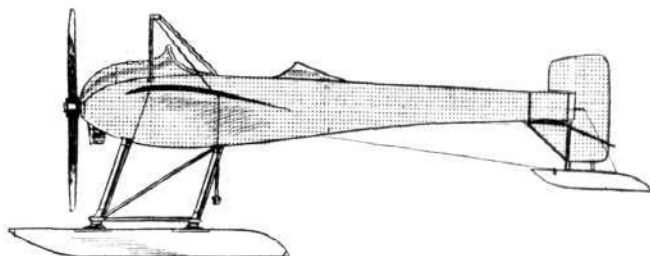
BOREL MONOPLANES (SOCIÉTÉ ANONYME DES AÉROPLANES BOREL).

Of hydro-monoplanes there are two exhibited at Olympia which are of French manufacture. Of these the Borel is one. It is a machine differing but slightly from the one that the same firm were showing at the Paris Show some few months since. Its main point of difference is that in this present machine pilot and passenger sit side by side, whereas in the former hydro-monoplane they were accommodated in tandem. On the Continent, the Borel firm have achieved great success, not only with their water-flying machines, but with those they manufacture purely for use over land. As a matter of fact, we have heard it from several sources that

organ, and so enables the machine to be steered with considerable accuracy over the water at slow speeds. Dual controls are fitted.

The *alighting gear* is formed by two main floats of catamaran type without steps, which are supported under the fore part of the machine by an exceptionally strong construction of streamlined steel tubes. The floats are of wooden construction, and have brass nose and tail fittings. With the exception of these latter fittings, the remainder of the metallic fittings of the machine are carefully painted, so that they will suffer no deterioration, even if the machine is left moored on the open water for a considerable period.

The wings are of ordinary standard Borel pattern, a pattern which has the characteristic feature that the rear spar in the wing construction is made considerably longer than the front spar, thus

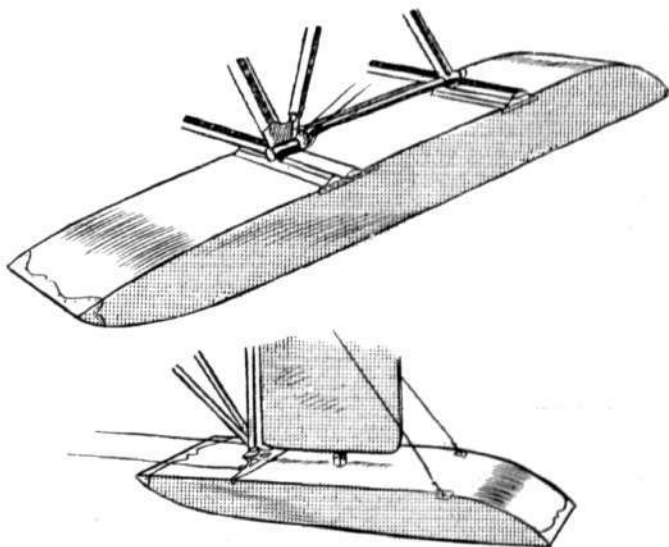


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The 80-h.p. Borel hydro-monoplane.

as a light and speedy monoplane, and, moreover, one that is capable of being flown in quite high winds, the 50-h.p. Borel monoplane is becoming increasingly popular with the officers of the French army. For their hydro-monoplanes, it will be remembered that they did particularly well at the Tamise hydro-aeroplane meeting in Belgium last year, where they were rated first in order of merit and won the trophy presented by the French Minister of the Colonies.

The body is formed by a rectangular section girder covered in, in front by aluminium sheeting, and by fabric at the rear. On over-hung bearings in front is mounted the 80-h.p. Gnome motor, which is covered over to a great extent by a sheet-metal dome, which not only prevents the oil being thrown in all directions, but minimises the chance of it becoming splashed when the machine is ploughing through choppy water. The interior of the cockpit is characterised by the luxurious nature of its various fittings. There is actually, mounted on the dashboard in front of the passenger, a neat flower vase, supported in position by a gold-plated fitting. There, also, are arranged the various instruments, such as compass, engine speed indicator, altimeter, &c., that are essential to a pilot undertaking long cross-country or cross-water trips. The control is in the form of a hand-wheel, which the pilot grips, which he may rock to and fro, and which he may rotate laterally to operate the warping. The steering gear is operated by a foot-bar, and it is an interesting point that the rear float supporting the tail is mounted directly to the rudder, in such a manner that it swings with that



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One of the main floats and the small tail float of the Borel hydro-monoplane.

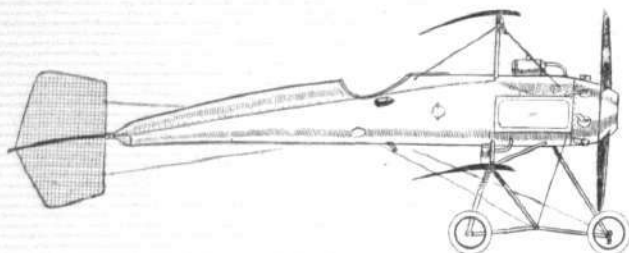
giving the wing tip a shape by which, amongst other advantages, a very powerful warp may be obtained. The Borel, or rather the Morane, monoplane, as it was then called, was the first machine to introduce this method of shaping the wing tip, a feature which many other designers have since adopted.

The principal dimensions and characteristics of this machine are: Overall length 8 metres 25; span 10 metres 58; area 18 sq. metres; weight (light) 350 kilos.; useful load (which includes pilot and passenger and enough fuel for a flight of 3½ hours) 280 kilos.; speed 63 miles per hour; price £1,320.

BREGUET AEROPLANES, LTD.

Breguet Aeroplanes, Ltd., who since July of last year have been constructing military biplanes under licence from the French Breguet firm, have on exhibition an

85-h.p. Breguet Warplane, the seventh machine they have built since their works at Willesden were put in operation. The outstanding feature of the machine is that it is built throughout of steel, wood being only employed for the manufacture of its ribs. Since he first turned his mind to aeroplane construction, Louis Breguet has favoured steel as the medium of construction of his machines, and to him must be given the credit of having "set the fashion," as it were, for this system of manufacture. He, also,



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The 85-h.p. Breguet biplane.

was one of the first to construct a tractor biplane, a type of machine which he has helped, in no small manner, to popularise. At first he was laughed at for his pains; his biplane was jokingly spoken of as a "coffee pot." But since, he has earned the recognition that he so well deserved.

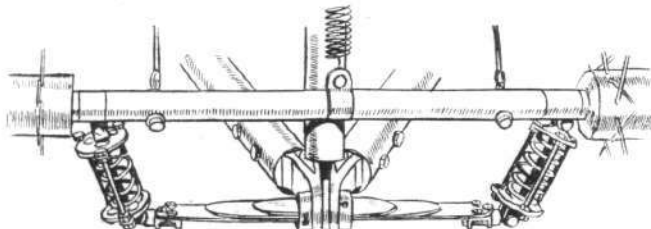
Next in order of importance of the features of his machine is the peculiarity that the supporting and directional surfaces are flexible. The controls, even, are not directly connected to the planes that they operate; steel tension springs are inserted in the control wires, so that, however harsh may be the pilot's movements of his controlling lever, the directional planes change their attitude gently. It is claimed for the Breguet machine that it has been designed as one harmonious whole, not merely as a series of separate units, such as body, chassis and planes, afterwards assembled together.

The body is of two distinct parts, that forward of the pilot's seat, and the portion that extends away behind it. The latter section is formed by a single steel tube, some three inches in diameter, which is braced by numerous steel wires to a four-armed steel fitting welded over the tube just behind the pilot's seat. By the application of sheet aluminium over these wires a very good streamline covering is obtained. The aluminium covering is further supported by longitudinal wood stringers. To the rear end of the large diameter central tube is attached the tail, universally jointed. In front of the pilot's seat, the foundation of the fuselage is formed by two U-section steel girders, wood filled. At right-angles to them, in front of the passenger seat, are fitted the two uprights to which the top planes are attached. Still further in front they

converge to form a substantial base to which the motor is bolted. From a casual glance at the machine, no one would think that the body is built in two sections, so gracefully is it streamlined from end to end. At the forward end the motor, an 85-h.p. 7-cylinder Canton Unné, is fitted, driving direct a propeller, the boss of which is covered by a semi-spherical cowl which effectively preserves the excellent lines of the body. Seated in a comfortably upholstered seat, the pilot controls the machine in its three dimensions of altitude, balance, and direction, by a hand-wheel, mounted on a pivoted column, and by foot pedals. On French built Breguets the warping of the planes is operated by rocking the vertical column laterally. On this point it is evident that the designers of the British Breguets have different ideas, for the plane warping on the biplane exhibited at Olympia is effected by means of the foot pedals. The hand-wheel rotates laterally, and is used to steer the biplane in a manner exactly similar to that of a car. The machine is made to rise or descend by rocking the column to and fro.

The landing gear is of a type by itself, since no other aeroplanes are, to our knowledge, fitted with an undercarriage that resembles it in the least. At rest the main weight of the machine is supported by two large diameter tyred-wheels, which are connected to the body by a pair of tubular oleo-pneumatic springs. Some part of the main weight is further taken by another pair of wheels in front of a much less track, which are jointed to a laminated cross spring bolted laterally across a tubular strut which extends downwards from the extreme nose of the body. These two front wheels are so designed that they pivot in conjunction with the rudder, and in this manner the machine may be effectively steered over the ground at slow speeds.

The planes are built about single tubular steel spars, which are universally jointed to the body. Over them fit the wooden



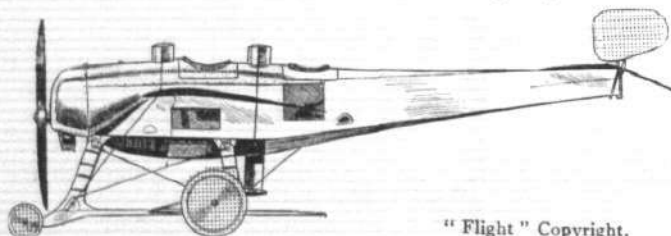
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Flexible suspension of the front pair of steerable wheels of the Breguet biplane.

I-section ribs, and they would be free to revolve around the spars were they not kept in position by steel leaf springs. These springs are so arranged that the faster the machine is driven through the air the less incident the ribs, and consequently the planes, become to the direction of the air flow. Owing to this system of plane construction, which is fully patented, by the way, the machine is rendered unusually stable and at the same time is given a remarkably wide speed range.

THE BRITISH AND COLONIAL AEROPLANE CO., LTD.

As the manufacturers of Bristol machines have an organisation far and away larger than any similar firm in England, or, we might say, with perhaps one or two exceptions, in the whole world, it is only natural to expect that their exhibit is one of the main centres of interest at Olympia. Both their machines—the monoplane which made its debut in the Military Trials, and the biplane, which has

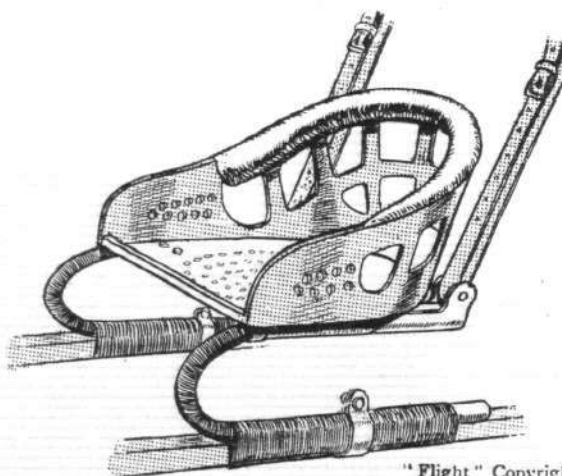


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The 80-h.p. Bristol monoplane.

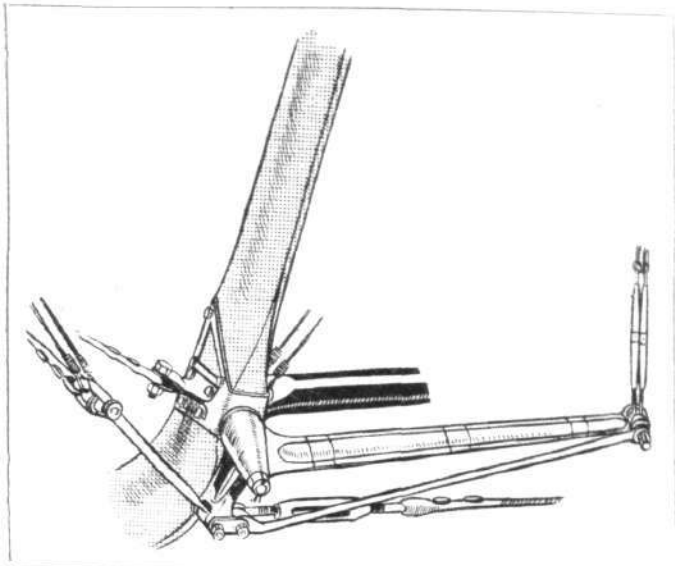
just been evolved from their Filton works—are of distinctive design and, as samples of workmanship stand, bracketed with one other machine shown, unrivalled, among all the various aeroplanes exhibited there. They both have been constructed to the designs of M. Henri Coanda, their clever engineer, of Roumanian birth. Since 1908 has M. Coanda been connected with the study and practice of aeronautics. He first began his experiments with the late Capt. Ferber in France.

It will be remembered that—was it three years ago or four?—Coanda exhibited at the Paris Show a particularly neatly designed



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The original method of cane suspension of the seats of the Bristol machine.

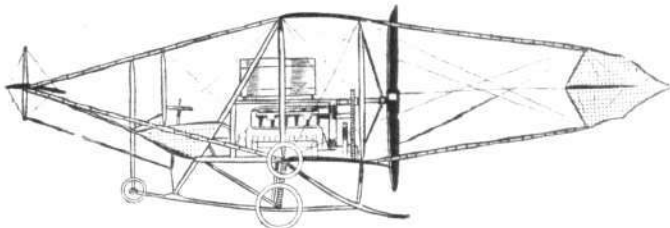


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The warping crank of the 80-h.p. Deperdussin monoplane.

THE 120-H.P. CODY BIPLANE.

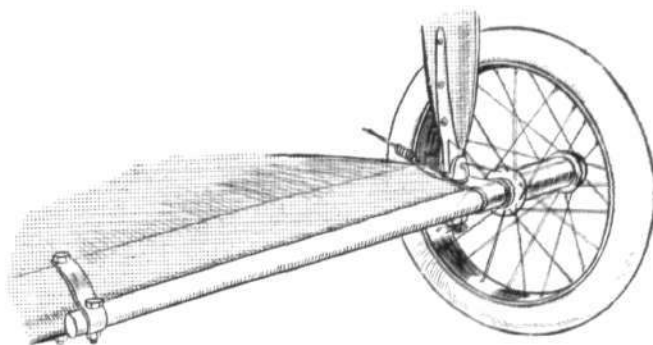
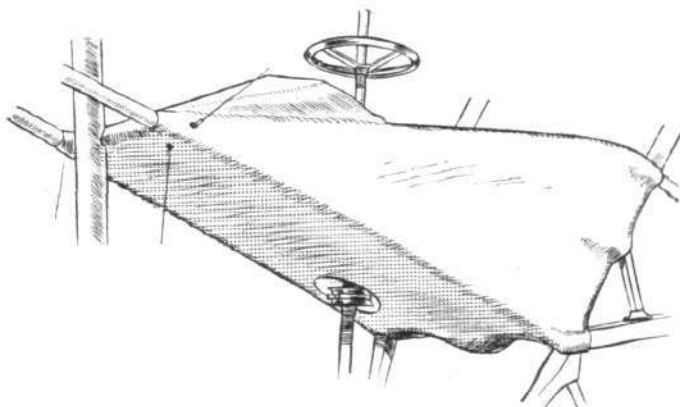
A very great deal of interest attaches to this Cody machine, for it must be remembered that its constructor was the first to supply the British Army with war kites, built for the British Army their first dirigible balloon, built their first heavier-than-air machine, and won the first prize in their first international aeroplane competition. A duplicate of the biplane that is exhibited not only won the competition to which we have just referred, but, fitted with a



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The 120-h.p. Cody biplane.

60-h.p. Green engine, it carried off the two Michelin competitions in 1911 and also completed the *Daily Mail* Circuit of Great Britain, while in 1912, with a 100-h.p. Green engine installed, it won the Michelin cross-country competition. Since it was constructed this biplane has flown upwards of 7,000 miles, which, if it is not a world's record, must be approaching very near to one.



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DETAILS OF THE CODY BIPLANE.—The sketch on the left shows the covered-in pilot's cockpit and control wheel, that on the right the mounting of the wing-tip wheels.

Planes.—The most noticeable feature regarding the Cody plane construction, one of the features to which Mr. S. F. Cody attributes the machine's remarkable speed range, is that the under surface is a great deal more cambered than is the top surface. On most other

bottom of the fuselage and a neat little carriage-built body for the protection of the occupants to the top. The passenger sits in front, just behind the motor, and by looking over the leading edges of the wings, he is able to obtain a very good view nearly vertically downwards. The pilot, if anything, has a still better view, for the wings on either side of his cockpit are cut away up to the rear spar for a short distance along the wing.

The landing chassis is somewhat different from the type that was standard a few months back. The wheels are now mounted on two laminated sweeps of wood which, in essence, combine the functions of skids and chassis struts. So that they may not be so liable to split, these chassis sweeps are covered over with canvas. There is no change in the manner in which the axle of the landing wheels is strapped by rubber cords to the rigid chassis structure.

The wings are of the usual design. Indeed, the only innovation noticeable is that the leading edge of the upper surface is, for some nine inches or so back, covered in by three-ply wood so that it may be more capable of retaining its correct shape, and that the wing construction in that part may be correspondingly strengthened.

There has been a change made in the manner in which the wing warping is operated. In earlier machines, the warping cables were carried to a rocking bridge mounted in the centre of the chassis. Now they are taken to bell-crank levers mounted to the rear of the chassis supports on either side, a system which was first put into practice on the terribly high-powered *monocoque* of this make which took Vedrines to victory in the 1912 Gordon-Bennett race held at Chicago.

machines the greater camber is usually noticeable on the upper surface. Behind the rear spars, there is a considerable amount of rib overhang, and, at high speeds, the wind pressure on this overhang is such that it has the effect of reducing the camber of the wing between the two spars. For the spars, they are cut from solid silver spruce, the front spar being rounded off in front, as it forms the leading edge of the plane. Solid spruce struts, 6 ft. 6 in. high, separate the two planes. In cross section they are of the original streamline that Mr. Cody arrived at as the result of experiments five years ago.

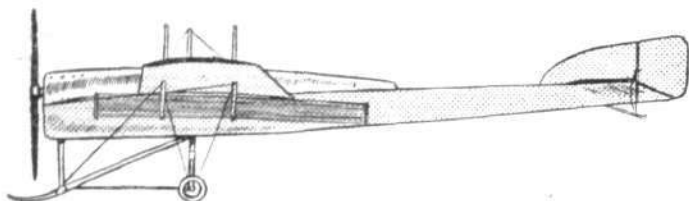
The landing gear consists of a hickory skid 16 ft. long, connected to the main planes by struts of the same wood. The rolling wheels form a unit independent of the skid. They have a track of 3 ft. 10 ins., and are sprung by steel compression springs. Regarding the strength of this chassis, it may be interesting to mention that the landing-gear fitted to the Cody monoplane is almost an identical structure to that of the biplane, and that when, flying his monoplane, Mr. Cody inadvertently landed on a cow, he neither felt the shock nor damaged his chassis in the least.

Changes in the attitude of the machine are brought about by two elevators of large area, supported in front of the main plane on bamboo outriggers. They are so connected to the controlling lever that they may be made to move in unison or in opposition, in which latter condition they assist the main plane warping in maintaining lateral equilibrium. Fitted behind the main planes is the propeller, 10 ft. 8 ins. in diameter, of Cody design and manufacture. It is driven by chain transmission, and the sprockets

are so designed that the ratio of engine revolutions to propeller revolutions is as $1\frac{1}{2}$ is to 1. This biplane, which can seat three passengers in addition to the pilot, has a speed range of from 47 to 75 miles per hour.

MARTIN-HANDASYDE (T. B. ANDRÉ AND CO., LTD.).

On the stand of Messrs. T. B. André and Co. is exhibited an excellent specimen of a Martin-Handasyde monoplane, equipped with an 8-cyl. Laviator motor of 80 h.p. Its lines, a matter, we should think, of general knowledge, greatly resemble those of the Antoinette monoplane. Scarcely two months since, we published



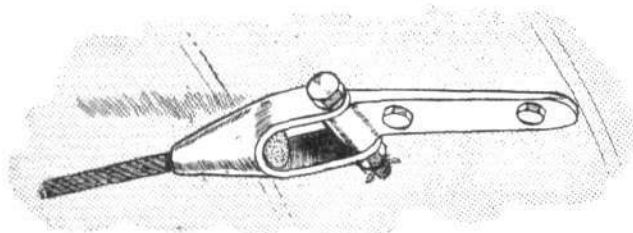
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The 80-h.p. Laviator-Martin-Handasyde monoplane.

a complete description, with several sketches, of a "Martinsyde" monoplane, which was practically identical with the one shown, excepting that it was driven by an engine of lower horse-power, a 60-h.p. Antoinette to wit. Let us, therefore, recall some of the remarks we printed then.

The body is boat-shaped, and has a cross-section which may be represented by a triangle standing upon its clipped apex. It is built up with four ash longerons, which are, in the process of construction, clamped down to a former.

Held in their correct positions by this ormer or mould, sheets of three-ply wood are bolted to either side. The sheets aft of the passenger's seat are then lightened by cutting away a diamond shaped piece from the centre of each. Those forward of that seat are left untouched, for at that part of the body much greater strains have to be borne. In front the motor is bolted to the top two longitudinal members of the body, and it is almost completely



One of the M.H. main lift cable fastenings.

covered in by an aluminium shield which lends to the fuselage more of a streamline form than it would otherwise possess. The lines of this shield are continued rearwards to a point behind the pilot's seat, by a superstructure of spruce and three-ply wood, which, covered with fabric and sloped, assists in keeping the occupants sheltered. The pilot sits behind the passenger, and his hands rest on a wheel, mounted at the head of a vertical column, by which he controls the monoplane in flight. His feet operate the steering of the machine in the horizontal plane.

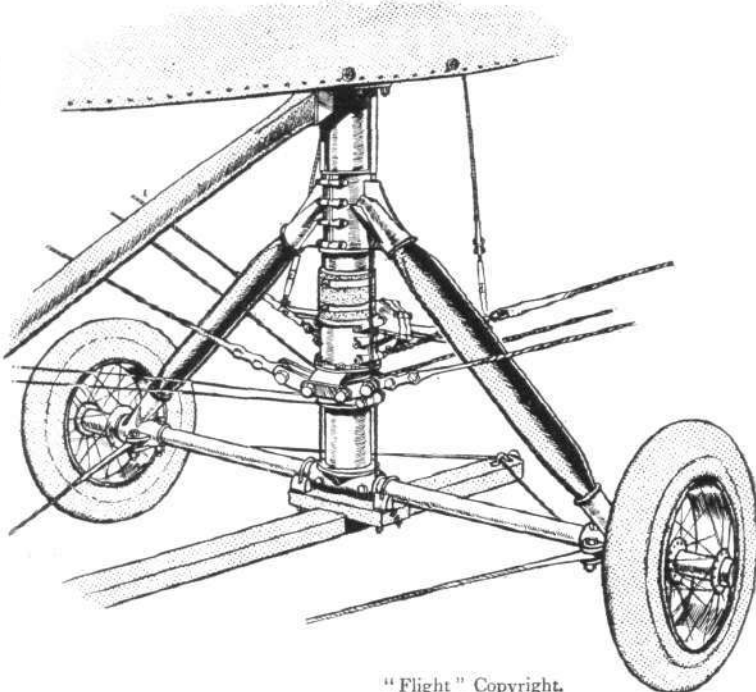
The wings are most carefully and strongly built, as may be seen from a specimen uncovered wing that is on exhibition on the stand. Its spars are of box section, with ash top and bottom strips and three-ply sides. Where they emerge from the sides of the body the front spars are 7 ins. in depth, tapering to 3 ins. at the tips. The rear spars are also 3 ins. deep at the tips, but are slightly smaller than the front spars at the roots. Both spars are braced by stranded cable stays passing over spruce king-posts erected approximately half way along their length. From the base of the front spar king-post an especially stout cable stay is run obliquely forward to a fitting on the front skid. This stay is designed to take the lift and drift of the wing.

SHORT MACHINES (MR. PERCY GRACE).

As the agent for Short machines, Mr. Grace is showing on his stand a new 80-h.p. Short tractor hydro-biplane. Going back a few months, it will be remembered that the first machine of this type that Messrs. Short Brothers built, was a 100-h.p. hydro-biplane, which was supplied to the Admiralty, and which was flown by Commander Samson at the Naval Manœuvres at Weymouth during the past year. Previous to that, however, he had completed a flight on this machine, which, although it did not receive a great deal of publicity in the general Press, was nevertheless a very fine achievement. The flight to which we refer was a non-stop run that Commander Samson made, taking with him a passenger from Eastchurch to Portsmouth, following the coast line. That same machine has, on many occasions, carried two passengers, beside the pilot, and a complete charge of fuel.

The 80-h.p. Short tractor hydro-biplane.—In general

An equally strong stay proceeds obliquely backwards from the same point to a fitting on the landing wheel mast, which cable is provided, not only to take a share of the lift, but to prevent the wing—which, by the way, weighs something like 110 lbs.—from straining forward owing to its own inertia when a landing is being

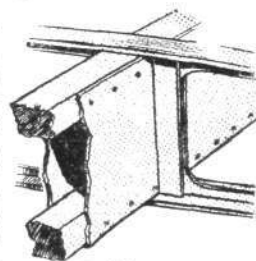


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The Martin-Handasyde landing gear and wing-warping mechanism.

made. Similar braces attached to the roots of the rear spar king-posts proceed to the main chassis mast, and these both take lift and operate the wing warping.

The landing chassis is similar to the Antoinette in appearance, and very similar to it in action, with the exception that, in the Martinsyde, the shocks of landing are absorbed by rubber springs in tension, whereas the Antoinette machine made use of a rather more elaborate system of pneumatic springing. From the point where the central chassis mast leaves the body on the underside, a long, curved hickory skid projects forward under the propeller, in which position it is stayed by a stout compression strut running downwards from the nose of the body. The relatively small landing wheels, shod with wide diameter pneumatic tyres, are mounted on a single axle, to the centre of which is mounted the massive steel tube which supports the main weight of the machine. The structure is made rigid laterally by two streamlined spruce struts.



The M.H. wing spar construction.

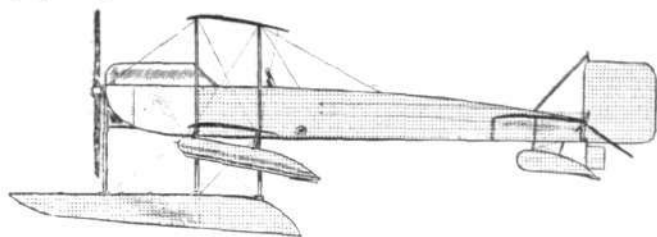
The tail is purely a flat directive organ, taking no share of the lift. Two flap elevators are hinged to its rear edge. There is a vertical unbalanced rudder preceded by a fin, and the whole is protected by a neat tail skid.

The machine has been designed for a maximum speed of 70 miles per hour. Without passengers or fuel aboard, she turns the scale at 1,100 lbs., and, in flight, can carry a useful load of 660 lbs.

appearance, both that machine and the one shown on Mr. Grace's stand differ but slightly. Naturally there are detail improvements, and among these we might mention that instead of the wings having squared tips they are rounded off, and that Messrs. Short Brothers have used steel tubular stanchions of stream-line section in place of wooden struts to separate the planes.

The body is a simple girder of rectangular section totally enclosed by fabric to reduce head resistance. In front, under an aluminium cowl, rotates the 80-h.p. Gnome motor that drives a large diameter Integral propeller. The engine is carefully shielded in, both on top and below, so that it may not become splashed by any spray that may be thrown up by the floats passing through rough water. In the body are, normally, seats for two, the passenger sitting in front. His seat however, is arranged to slide to the right so that another seat may be placed to his left and so provision made for the

carrying of an extra passenger. The pilot's seat is arranged behind the passenger in such a position that he has a very good view of all that is going on around him. He controls the machine by means of a vertical wheel mounted at the head of a column jointed so that it may be rocked to and fro. By pushing the wheel from him or by pulling it towards him he can make the machine descend or



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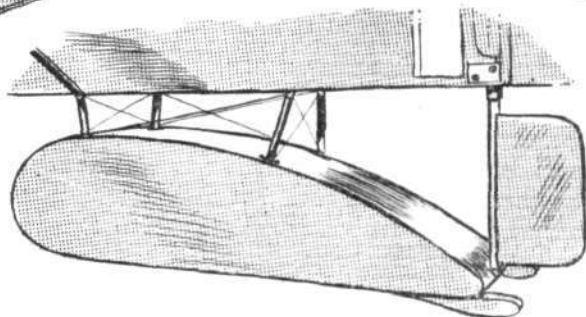
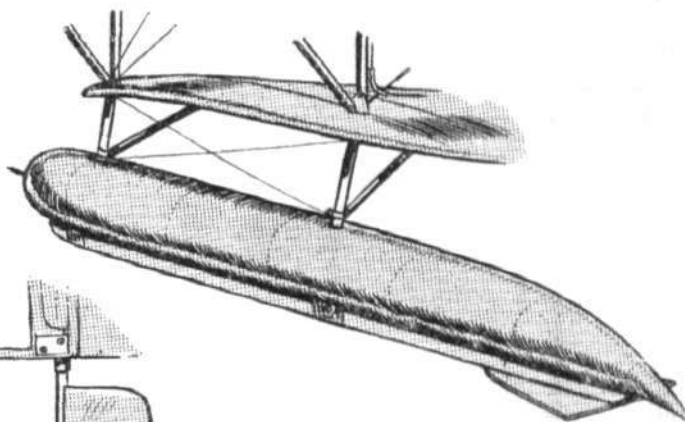
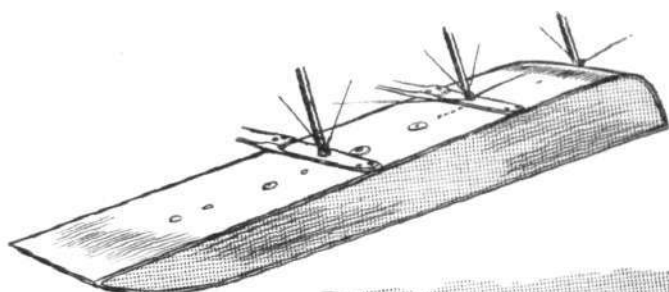
The 80-h.p. Short tractor hydro-biplane.

ascend: by rotating the wheel he controls the lateral balance. The rudder is connected by a pivoted foot bar on which his feet rest. That the engine may be set in motion without any necessity for the occupants descending from their seats, a starting handle is fitted in the passenger's cockpit. The writer noticed at the Paris

operated from the pilot's seat, by means of which each cylinder may be given its priming of petrol prior to the motor being swung by the passenger. The main tank is stored on the floor of the body at the approximate centre of pressure of the machine, and from there it is supplied to a service tank under the cowl of the motor by a small wind-driven automatic pump. Enough fuel is carried for a flight of six hours.

The planes span 48 ft. and 30 ft. respectively. They have a chord measurement of 5 ft. and are separated by twelve streamlined steel struts. Ash, of H section, is used for the front spar, whereas the back spar, of the same material, is roughly of rectangular section. The ribs are of spruce, and their construction is such that it is almost impossible for them to split. Lateral balance is controlled by ailerons fitted to the top plane on either side of the machine. The extensions are supported by steel tubes.

Float construction.—Two long catamaran-type floats are connected to the body of the machine by stout steel struts. These floats are not stepped—they are simply plain pontoons. They are separated at a sufficient distance to give the machine a good flotation base, but should the machine be inclined to tip sideways for any reason while floating, the tips of the lower plane are guarded by subsidiary floats mounted on them. These latter floats are illustrated by one of our sketches. They are made up in cylindrical form from canvas, with a skeleton of strip steel inside, so that should they become punctured they will still retain their shape. There is also a small float fitted to the tail.



The floats of the 80-h.p. Short hydro-biplane.

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Aero Salon that many hydro-aeroplanes fitted with Gnome engines had similar self-starting devices, but at the same time he wondered how they could possibly be of any use, for it is a well known thing that unless a Gnome motor is primed with petrol in each cylinder no amount of swinging over will get it to fire. On the Short machine, however, the constructors have fitted a petrol injector,

The tail is non-lifting and of conventional type. In order that the machine may be steered readily at slow speeds on the water the air rudder works in conjunction with a water rudder.

This Short tractor hydro-biplane, an excellent sample of careful design and construction throughout, has a maximum flying speed of 65 miles per hour.

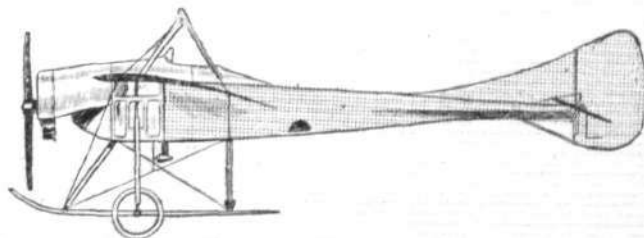
MESSRS. VICKERS, LTD.

They are represented by two exceedingly businesslike looking machines, an 80-h.p. Gnome engined monoplane and a military biplane equipped with one of the new 60-80-h.p. Wolseley aero motors. For some three years now has this noted firm had in operation an aviation department under the direction of Capt. H. F. Wood, himself a pilot of no mean order. Their designer, Mr. Archibald R. Low, M.A., who is responsible for the drawings of the two machines exhibited, is also an experienced pilot. Both the monoplane and the biplane shown may to all intents and purposes be considered as all-steel machines, for wood only enters into their construction for the shaping of the ribs, for the landing skids, and for the filling pieces by which the tubular struts are brought up to streamline section.

The 80-h.p. Vickers Two-seater Monoplane.—This monoplane is of the same type as the one which, fitted with a 70-h.p. stationary Viale motor, put up such praiseworthy flights at the time of the Military Aeroplane Competitions in August last. The identical machine shown, driven by a 70-h.p. Gnome motor, has done upwards of 500 miles in the air at the Vickers private flying ground at Erith, piloted by the late Mr. Leslie Macdonald and by their present pilot instructor, Mr. Barnwell.

Its body is an all-steel structure, built lattice girder fashion, with

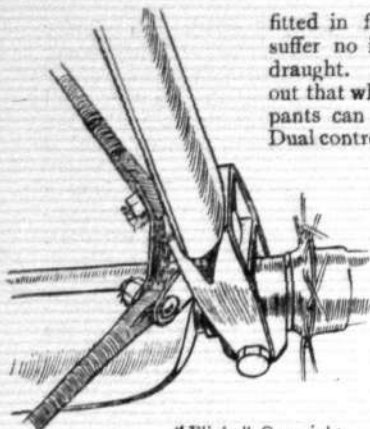
light tubular longitudinals and tubular cross members. They are assembled by means of welded steel sockets, the joints being afterwards sweated together and pinned. At the front end the four longitudinals meet in a flat upright plate, which serves as one of the



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The 80-h.p. Vickers monoplane.

mounting plates of the motor. Further support for the motor is provided by a stout flanged plate arranged some little distance behind the front cap. Seats are provided for the pilot and passenger side by side, and there are transparent wind shields



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A chassis detail of the Vickers monoplane.

fitted in front of them, so that they may suffer no inconvenience from the propeller draught. So carefully has this been carried out that when the machine is flying the occupants can detect scarcely any wind at all. Dual control is fitted. The seats are arranged well forward in the body, so that the occupants have a good clear view over the leading edge of the wings. To still further increase their range of vision, Cellon windows are let into the sides of the body. An interesting fitting in the cockpit is a Clift anti-drift compass, which is mounted over a hole in the floor and by which the machine may be kept on a true course in a side wind.

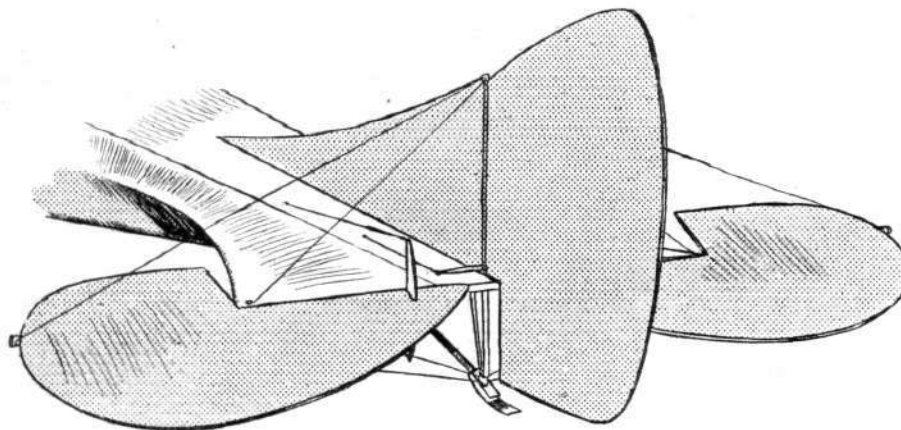
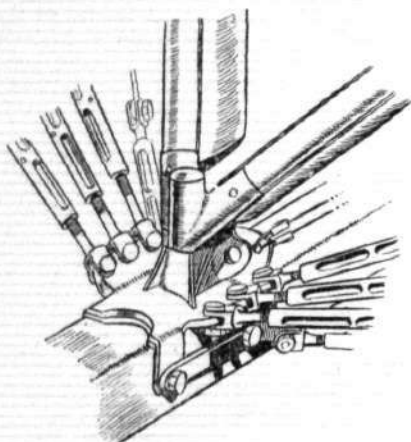
The landing chassis is of the central skid and double wheel

motor installed, the machine has been timed to attain and maintain a speed of over 70 miles per hour.

The 60-80-h.p. Vickers Biplane.—A very interesting machine, not only for the fact that, hitherto, the Vickers organisation have confined their attentions exclusively to monoplane construction, but for the great amount of thought and care that, it is evident, has been spent on its construction and design. Standing before this biplane, the first feature that arrests the attention is that there is a Vickers automatic gun protruding from the front of the neatly rounded Duralumin covered body. Then, even the lay mind can arrive at the principal reason why the propeller has been arranged at the rear of the machine—it is designed to have that position mainly in order to give an unobstructed range of fire in front of the biplane.

The body of the machine, which extends forwards from the main planes, is constructed in a precisely similar manner to that of the monoplane we have just described.

In its interior sit the passenger and behind him the pilot, both sheltered to a great extent from the wind by the neat metallic covering that is fitted over the body. Seated in front, the observer, and he will have to be a gunner too, has a perfectly clear view all



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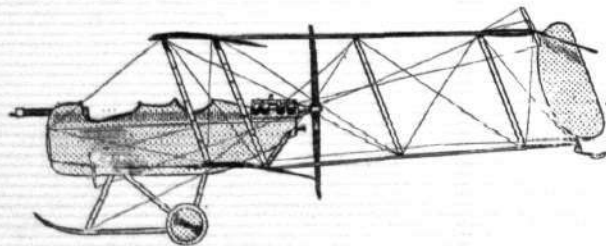
VICKERS MONOPLANE DETAILS.—The sketch on the left illustrates the fitting by which the two front V-set chassis struts are assembled to the central skid. It also shows how the wing cables are attached. That on the right shows the tail.

type. Two V's of stout steel tube support the body from a long ash skid, which is curved up in front and which is armoured by the application of Duralumin sheeting. Two axles, carrying the rolling wheels, extend on either side of the skid. Landing shocks are absorbed by elastic springs in tension.

The wings are built about two tubular steel spars cored with wood. Over them the ash ribs are loosely fitted in such a manner that continual warping of the wings does not tend to weaken them in any way. On the under side of the wings three stranded steel cables proceed to each spar, and these take the main lift. In a similar manner the wings are braced from above to a cabane above the pilot's cockpit.

around him. The gun before him is arranged to swivel through an angle of 60° in both horizontal and vertical planes, while the ammunition is stored in a box, travelling on wires, beneath his seat. When the gun is not in use the ammunition box is in a position just over the centre of pressure of the planes; when it is required to operate it, the box is wound forward on its wire rails and brought within reach of the gunner. As we have remarked, the pilot sits immediately behind him, and he grips a double-handled vertical lever whereby he controls the machine. Still further behind, the motor is mounted, its lugs bolted to the top two members of the fuselage.

The planes are made on a system which has little difference from that observed in the building of the Vickers monoplane wings.

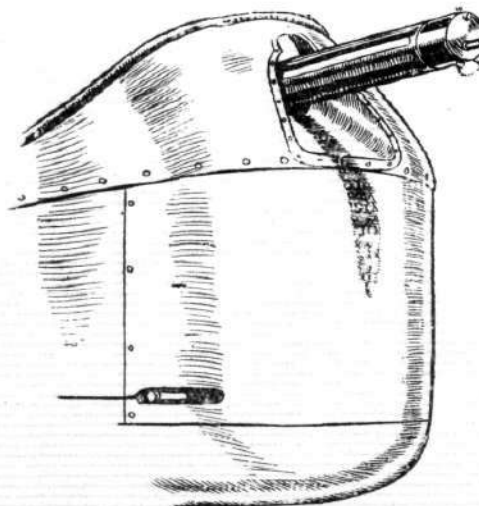


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The 60-80-h.p. Vickers biplane.

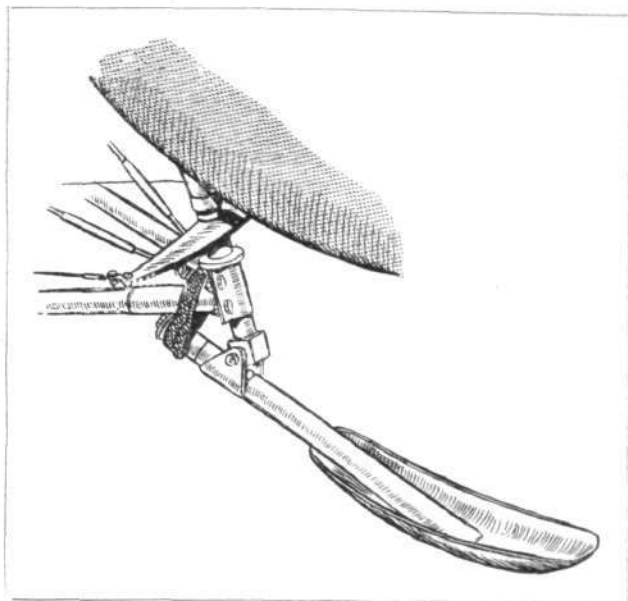
The tail is formed by the splaying out of the body at the rear to give a fixed stabilising surface behind which are hinged the two lifting flaps. On this monoplane, as distinct from the one that flew in connection with the Military Competitions at Salisbury, a vertical fin is fitted, which precedes an unbalanced directional rudder. A small steel skid protects the tail unit, but it is probable that it very seldom comes into play, for most of the weight of the tail on landing is taken by the backward laminated extension of the main landing skid.

Fitted with an engine of 70-h.p., this monoplane shows a speed of 63 miles per hour, and is capable of climbing with the useful load aboard of pilot, passenger, and sufficient fuel for a 3½-hours' flight at the rate of 250 ft. per minute. With an 80-h.p. Gnome



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The front of the cockpit of the Vickers biplane, showing the mounting of the automatic gun.



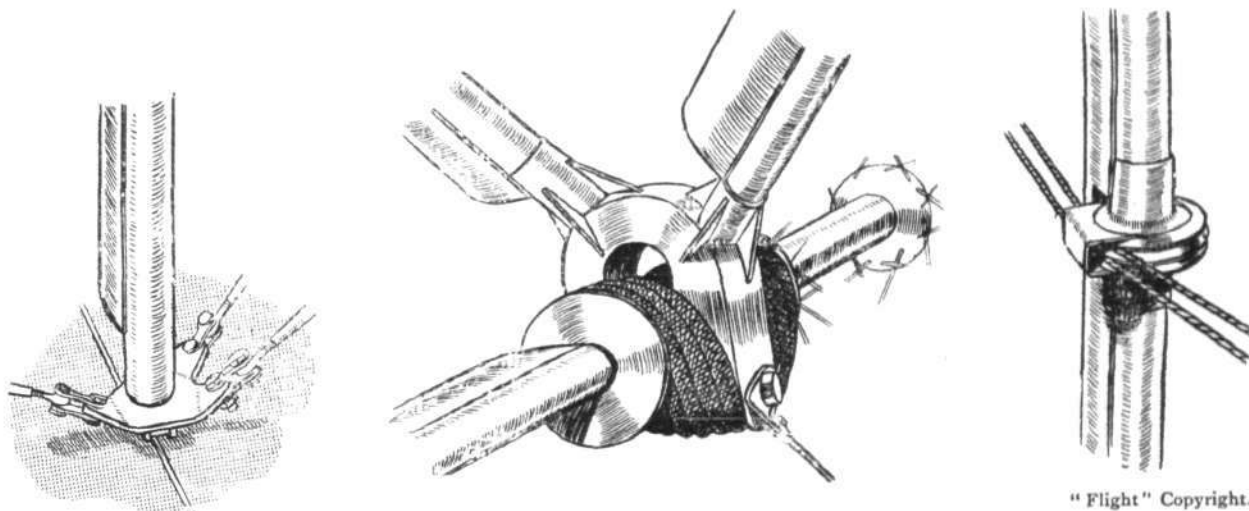
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The Vickers biplane tail-skid, which rotates with the rudder, allowing the machine to be steered when running along the ground.

of the planes, stranded steel cable is employed in this machine. As a matter of fact, all the bracing throughout is of stranded cable, excepting in the body, where stout wire is used. The planes are so designed that in a very little time they may be dismantled, leaving only a centre section that is no wider than the body itself. Close examination of this central section of the top plane will reveal that in its interior there is a small petrol tank from which fuel is fed to the motor by gravity. It is supplied from a main tank in the body, under pressure, and the tubes leading to and from it are neatly tucked away behind the wooden filling pieces that are used to "streamline" the tubular *cellule* spars. By the way, the machine does not carry an oil tank, for sufficient oil is stored in the base-chamber of the motor to last for a six hours' flight.

The landing chassis is, at first sight, very much like that of the monoplane. Its flexible suspension, however, will be found to be altogether different. A central hollow skid of ash is joined to the body by 2 V's of steel tubing. Two other V's of tubing extend downwards and outwards from the side of the body, and, in crutches at their lower extremities, the axles of the landing wheels travel against the tension the strong rubber springs. (See sketch.) Altogether, the chassis is exceptionally light and compact, and, moreover, looks strong enough to bear any ordinary landing strain that it is likely to be subject to. Differing from the monoplane, too, there is no backward extension of the central landing skid. The weight of the tail is carried by a small steel spoon-shaped tail skid, so fixed that it pivots with the rudder and enables the machine to be steered more or less accurately over the ground at slow speeds.

The tail, level with the top main plane in flight, is attached to the top of the tubular steel tail outriggers. In plan form it is approximately rectangular, and its interior construction is of steel



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DETAILS OF THE VICKERS BIPLANE.—On the left, quick detachable strut fitting. In the centre, the details of the flexible suspension. The sketch on the right shows how the tail controlling cables are guided round one of the plane struts.

They are "staggered," as will be seen from one of our illustrations. Contrary to the more usual plan of using piano wire for the bracing

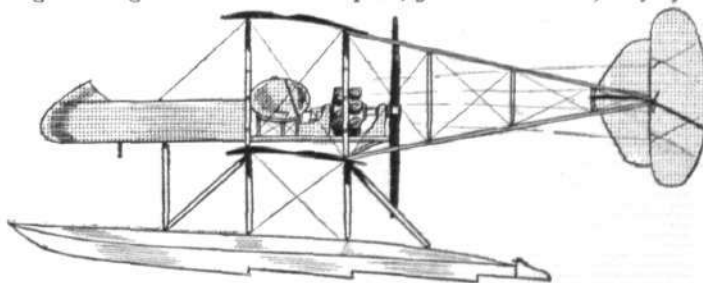
throughout, tubing being used for its outline, while the cambered ribs are of channel section, acetylene-welded in position.

J. SAMUEL WHITE AND CO.

On their stand, to the left of the main entrance, this firm is showing a high-powered hydro-biplane. Unfortunately, through a lack of sufficient space, it was found impossible to assemble the whole machine. However, although the outer sections of the planes are not fitted, quite a good idea of the machine as it appears when in flying trim, can be gathered from wash drawings that are shown on the stand. This hydro-biplane has been built to the designs of Mr. Howard T. Wright, who, as most people interested in aviation know, is in charge of the aeronautical department of the above well-known firm of naval Government contractors. He has devised and constructed a machine which he claims will have a speed range of from 30 to 70 miles an hour, which will be capable of alighting on and starting off from rough water, and which will be easy to fly.

Wing construction.—The most notable point regarding the wing construction is the original cross-section that is employed. On the under-surface of the planes there is a single camber, but on the top surface two distinct cambers are noticeable. Mr. Howard T. Wright has taken out patents on this particular aerofoil cross-section, and, it having been tested by Eiffel in Paris, it has been found to give an exceptionally wide speed range. Further, it has the property that the location of its centre of pressure travels but little for wide

variations in the angle of incidence. At its maximum speed, the planes are designed and adjusted so that they will fly at a slight negative angle. At the lowest speed, 30 miles an hour, they fly



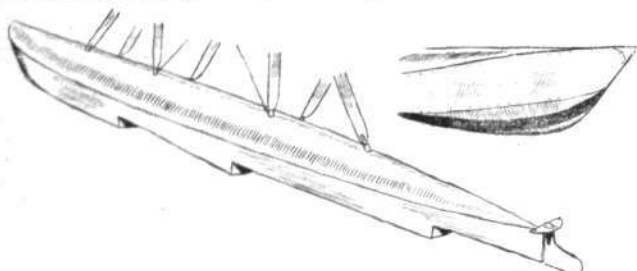
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The 160-h.p. Samuel White Navyplane.

positively incident to the wind at 15° . The planes are built about two main spars, which are of box cross-section and which have spruce sides and elm strips top and bottom. Where struts are

carried to the spars, and where the alighting gear is attached, the hollow spars are cored with solid elm. Most of the ribs which give the shape to the plane are of I-section spruce.

Sixteen struts of spruce separate the planes, the eight centre ones



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Details of the floats fitted to the I. Samuel White hydro-biplane.

being solid, while the remainder are of hollow construction. Compensating ailerons are used for balancing.

Float construction.—The machine rests on the water on two long torpedo-shaped floats, built according to Messrs. J. Samuel White's

patents covering their design and method of construction. They each have three steps, the two forward ones being arranged immediately below the two vertical struts that take the main weight of the machine. On the under side they are convex, a shape which makes them particularly suitable for open-sea work. Their interior construction is mostly of three-ply wood and elm, while they are covered with very fine three-ply cedar, a selection of materials which gives enormous strength with quite light weight. Although these floats are of considerable size they only weigh 100 lbs. each complete with their fittings.

The body, which proceeds forward from the main plane, so that the occupants may have a good clear view all around them, is a lattice girder of the usual type with elm longitudinal members and spruce cross pieces, covered with fabric. It seats two persons in tandem, the pilot taking the front seat where he controls the machine by means of a vertical universally jointed lever for fore and aft attitude and balancing, and a foot-bar for the rudder. The big 160-h.p. rotary Gnome motor is mounted between two heavy flanged steel plates at the rear end of the body, and drives a large diameter Chauvière propeller with armoured tips. Fuel is stored in a large 40-gallon tank, from which the petrol and oil feed down to the engine by gravity.

The tail, supported by a pair of triangular outriggers, carries vertical and horizontal fixed stabilising surfaces, two elevator flaps, and an unbalanced rudder.

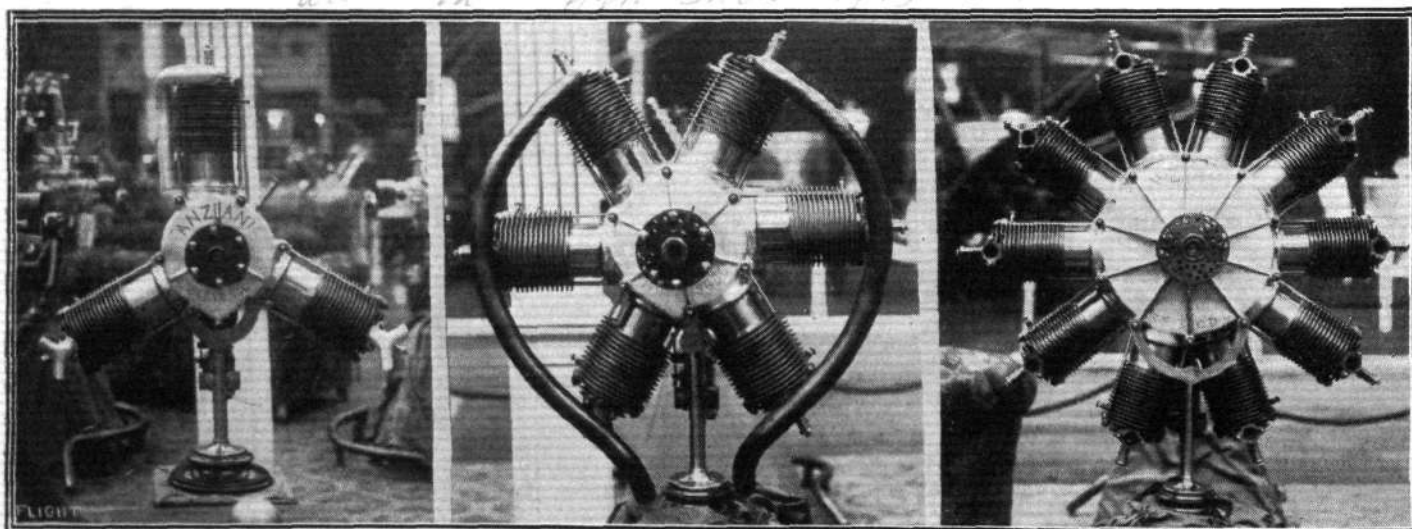
THE ENGINES AT OLYMPIA.

At the previous Aero Shows which have been held at Olympia, the motors specially designed and manufactured for aerial work have had to be content with a more or less secondary place, not only as regards the actual position of the stands on which they were exhibited, but also in the mind of the public, with whom the chief interest was in the arrangement of surfaces, controls, &c., of the various machines. Flying itself was such a novelty that there was very little room for consideration of the engine which made it possible. Now, however, the motors are coming into their own, and at this latest show—the first of its kind to be entirely devoted to Aeronautics—the motors are found in what might be termed the *Grande Nef*, being displayed on the row of stands down the centre of Olympia. And it must be admitted that the engines on view are worthy of such an honour, for have not practically all of them—whether British, French, German or Austrian—made their mark in one direction or another, either in this country or on the Continent. Although to the casual visitor they may not appear to be many in point of numbers yet they are a goodly company and as our photographs show, represent a variety of types and a range of power which should for the present help forward the requirements of aerial work. The technical student will find that since the last show, two years ago, considerable improvements have been effected in design and manufacture, so that the engines are now much more efficient and economical, two faults which were strongly pronounced in the earlier types of aviation motors.

ANZANI.

This famous French make is represented on the stand of the General Aviation Contractors, Ltd., 30, Regent Street, London,

S.W., by no less than five different models, ranging from the 30-h.p. 3-cyl. Y engine, which has proved so popular for school work and light engines, to the 100-110-h.p. engine, which has ten cylinders. All the engines are of the fixed type, although the cylinders are ranged radially round the crank case. In the latest models several important improvements suggested by the extensive experience of the past year have been incorporated, and as these new details have been thoroughly tested before being adopted as standard, the 1913 Anzani will doubtless acquit themselves even more creditably than their predecessors. One of the new features which will be especially appreciated by the pilot is that the engines no longer treat him to a shower bath of oil, there being no holes in the base of the cylinders as in the older types. The new system of lubrication is by a forced feed pump, which ensures a better distribution of the oil to the places where it is wanted. Another fresh detail is the fitting to the ignition of an advance and retard lever by means of which the speed of the engine can be regulated by the pilot. All the 1913 models are fitted with the latest patent Zenith carburettors which, together with the inlet pipes, are now arranged behind the cylinders where they are amply protected from the headwind. The 40-45-h.p. Anzani with six cylinders, the bore and stroke being 90 mm. by 120 mm., has been designed to meet the demand for an engine of medium power between the 30-h.p. and the 50-60-h.p. The latter has six cylinders, and the bore and stroke is the same as in the case of the 30-h.p., 105 mm. by 120 mm. The other two models each have ten cylinders, the bore and stroke of 80-h.p. being 90 mm. by 130 mm., while the dimensions of the 100-110-h.p. engines are 105 mm. by 140 mm.

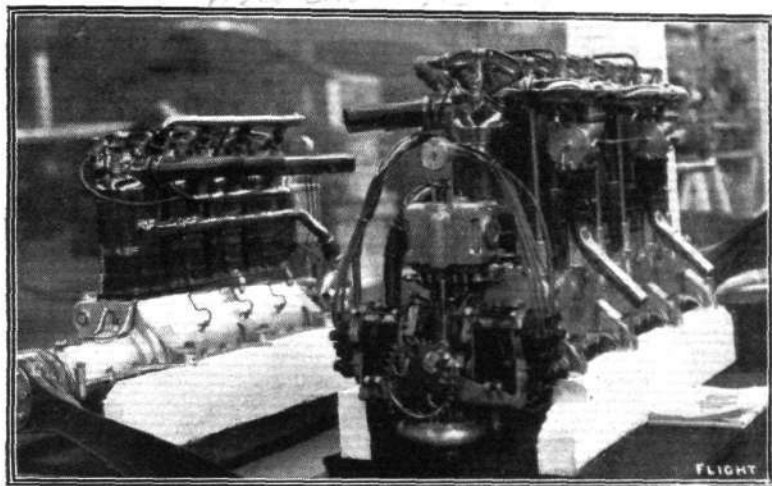


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THREE OF THE ANZANI ENGINES.—On the left the popular 30-h.p. 3-cyl. type, in the centre the 50-h.p. 6-cyl., and on the right the 100-h.p. 10-cyl. motor.

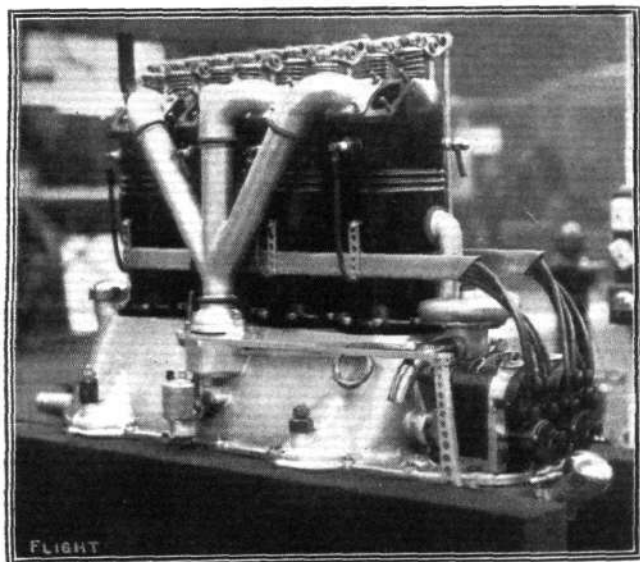
AUSTRO-DAIMLER.

These engines, exhibited by the Austrian-Daimler Motor Co., Ltd., 112, Great Portland Street, W., are well known in this country by reason of the fact that it was with one of the 120-h.p. type fitted to his biplane that Col. Cody has done so much flying, and also secured the two chief prizes in the British Military Competition last year. They are not, however, without honour in their own country, as it was with a biplane so fitted that Lieut. Blaschke made his world's height record at Vienna last June. Two types are on view, the 65-h.p. 4-cylinder and the 120-h.p. 6-cylinder, while a 90-h.p. engine is to be seen *in situ* on the Sopwith Bat-Boat. The 90-h.p. engine has six cylinders and



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The 65-h.p. and 120-h.p. Austro-Daimler motors.

is simply an extended edition of the 4-cylinder 65-h.p., the cylinder dimensions being the same, 120 by 140 mm. All the engines have electrically deposited copper water jackets and both inlet and exhaust valves are arranged in the cylinder heads, being operated by overhead rockers driven by a push rod, while the valve springs are of the flat laminated type. An electrical self starter is fitted to all the engines. In the 65-h.p. and 90-h.p. engines ignition is by high-tension magneto, with supplementary accumulator ignition, and in the largest engine two separate magnetos are fitted. Lubrication is by a pressure feed and a sight gauge is fitted to the oil reservoir.



"Flight" Copyright.
The 100-h.p. Benz motor.

To both 6-cylinder models two synchronised carburettors are fitted, and they are hot water jacketed. These engines are also fitted with a tachometer.

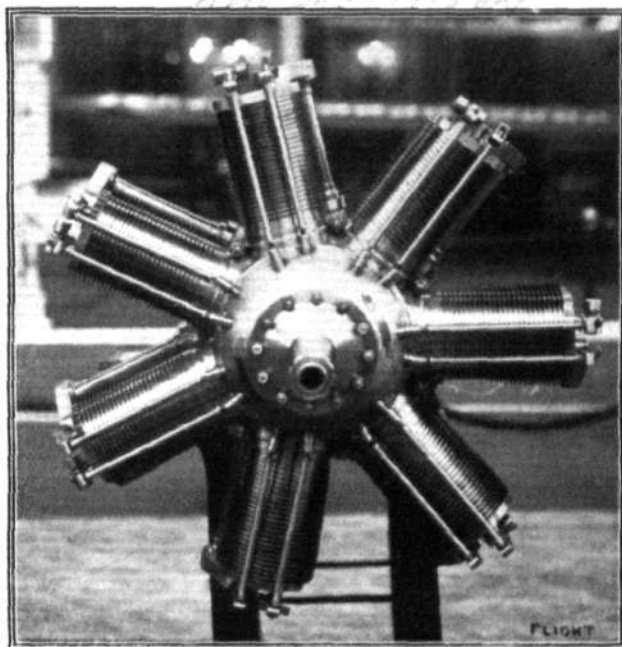
BENZ.

The Brompton Motor Co., Ltd., 78, Brompton Road, London, S.W., only exhibit one engine, but that is the 100-h.p. Benz which carried off the Emperor's prize in the competition recently held in Germany. It is a 6-cylinder water-cooled motor, the bore being

130 mm., and the stroke 180 mm., and during the tests it developed its rated horse-power at between 1,250 and 1,300 revs. per minute. During the seven hours' brake test it developed 103-h.p. continuously at 1,290 revs. and it was accelerated to 1,380 revs. per minute. All the parts whose failure might cause a stop have been duplicated so that there are two magnetos, driven by separate timing wheels, two oil circulating pumps, driven from different positions, and each inlet and exhaust valve is held to its seat by two concentric springs, either of which is capable of closing it. The cylinders are of cast-iron, as being less liable to distortion than steel, with sheet steel water-jackets welded on by the Autogenous system. The carburettor is in the base-chamber, thus utilising the heat there. Special attention has been paid to the reduction of vibration, and all moving parts are very carefully balanced. During the Kaiserpreis Trial the petrol consumption worked out to less than 210 grammes per horse-power-hour. The water circulation is carried out by a centrifugal pump, and the weight of the engine, with magnetos, &c., is said to be just over 300 lbs.

CLERGET.

It will be remembered that at the first Aero Show Messrs. T. B. Andre and Co., 5, Dering Street, London, W., introduced the Gnome rotary engine into this country. At the present show they are displaying on their stand one of the new 50-60-h.p. Clerget motors

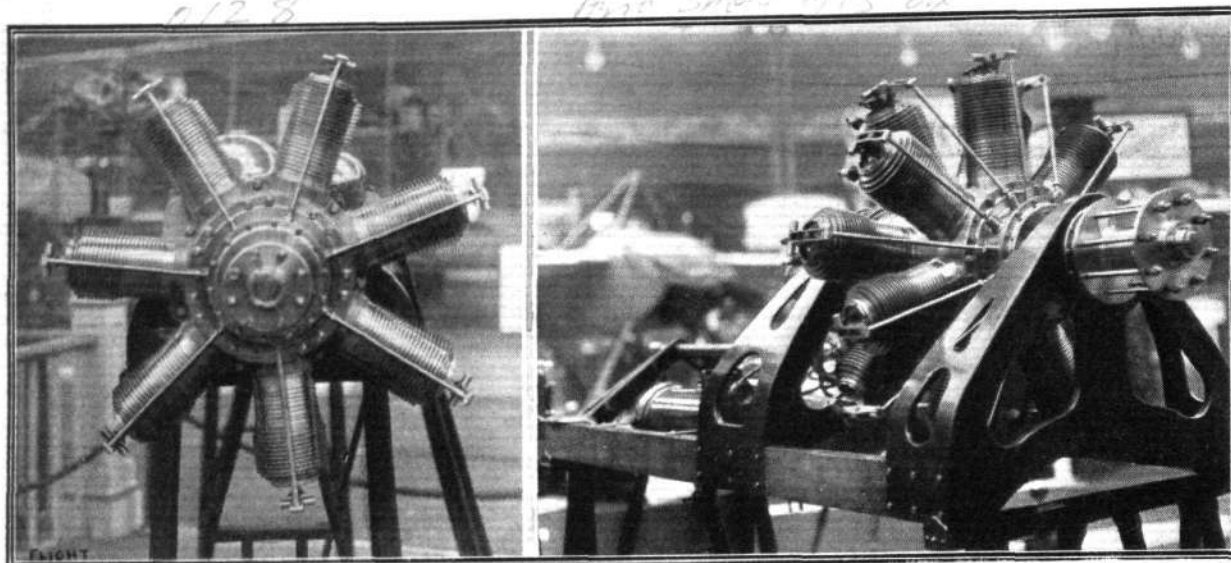


"Flight" Copyright.
The 50-60-h.p. Clerget rotary motor.

of the rotary type, with which some fine flying has been accomplished in France. It has seven air-cooled cylinders, 120 mm. bore by 120 mm. stroke, and its normal speed is in the neighbourhood of 1,250 revs. per min. The petrol consumption is given as 4.75 gallons per horse-power-hour, while the oil consumption is stated to be one gallon per horse-power-hour. The weight of the engine complete and ready to run, with all cooling devices, magneto, carburettor, &c., but without petrol and oil tanks, is given as 200 lbs.

GNOME.

In the 50-h.p. 7-cylinder and the 100-h.p. 14-cylinder motors, the Gnome Engine Co., of 47, Victoria Street, London, S.W., who are the sole representatives of La Société des Moteurs Gnome for Great Britain and the Dominions, show what are, perhaps, the two most popular models of this famous rotary motor. It is surprising what little alterations have had to be made since these motors were first introduced at the first Rheims meeting in 1909, when machines so fitted carried off nearly all the chief prizes. Various detail improvements have, however, been introduced into the design which make the 1913 motors even more reliable than before; but, generally speaking, the design is unaltered from that which has rendered such good service this year. The two engines on view are shown complete, and mounted on bearers with the usual fuel and oil tanks and other accessories. They are remarkable examples of the engineer's art, and the finish is that which has always characterised the workmanship of the Seguin Brothers. In future the motors are to be fitted with a carburettor of Gnome make, which will permit of the engine being throttled down to 300 r.p.m. A starting handle and gear is now fitted so that the engine can be started up by the pilot when on board.



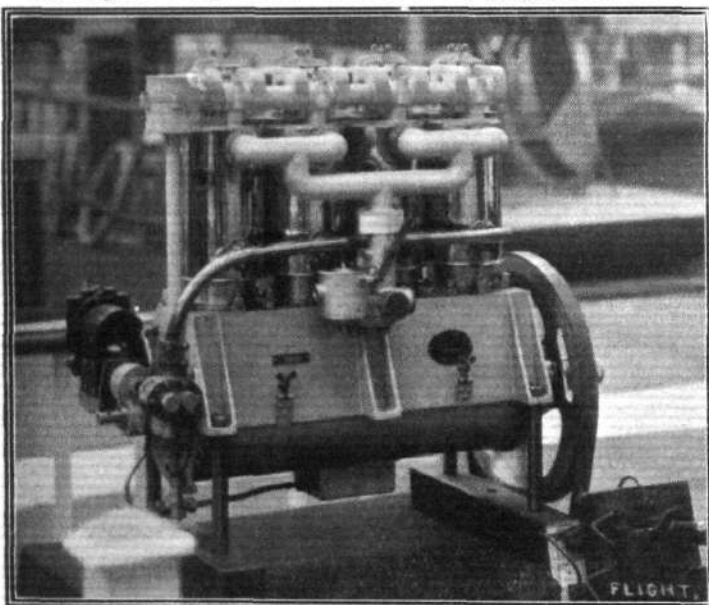
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THE GNOME MOTORS.—On the left the 50-h.p. 7-cyl. type, and on the right the 100-h.p. 14-cyl. engine complete with the usual mountings, &c.

GREEN.

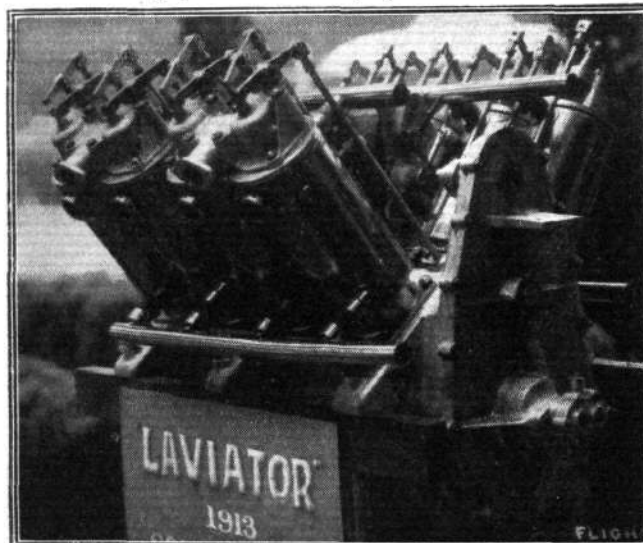
The Green Engine Co., Ltd., of 166, Piccadilly, show their three standard models, the place of honour in the centre of the stand being taken by the 50-60-h.p. Green engine which won the Patrick Alexander prize in 1911, and created a world's record by running for 24 hours without a stop. Both the 30-35-h.p. and the 100-h.p. models have also records to show the makers' claim for reliability is a proved one, and it will be remembered that in the winning flight of 186 miles for last year's cross-country Michelin prize Mr. Cody's machine was fitted with one of the 100 h.p. motors. The engines are of the vertical, water-cooled type, with detachable copper water-jackets. These jackets are pressed from a single piece of sheet copper, and they are held in place by the domed nuts that fasten the valve-cages to the cylinders. At its lower end the jacket makes an

the General Aviation Contractors, Ltd., show three, two of which are of the "V" type, while the other is a six-cylinder vertical engine of 250-h.p., intended for dirigible work. They are all of the water-cooled type, and it is claimed that the weight of the aeroplane engines, in running order, with radiator and water supply, works out to only 4.2 lbs. per h.p. The cylinders are steel forgings, and they are fitted with copper water-jackets. The inlet valve is arranged concentrically with the exhaust valve, which is kept cool by the passage of the incoming gas. The valves are fitted in a valve-box, which is held in the combustion chamber by a large cylindrical nut, and examination of the valves is a very simple matter, as both valves with the box can be taken out after undoing this nut. Two carburettors are fitted, each feeding one set of four cylinders. Lubrication is by pump, drawing its supply from the lower half of the crank-case, which forms an oil tank, holding sufficient for a five hours' run. The pump forces the oil to the three main bearings, and from thence, by the hollow crankshaft it



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The 30-h.p. Green motor.



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The 80-h.p. Laviator (Dansette Gillet) motor.

expanding joint against a rubber ring, carried in a grooved collar on the cylinder casting. The cylinders are steel castings, and are machined inside and out. All the valves are interchangeable, the inlet and exhaust-valves being arranged side by side in a cage which fits in the cylinder-head, and is fastened by a domed nut. The valves are ranged along the centre line of the engine, and are operated by an overhead camshaft and rockers. The magneto and water-pump are arranged at either end of a transverse-shaft driven by skew gearing, while the oil-pump is fitted at the lower end of the vertical spindle which drives the camshaft.

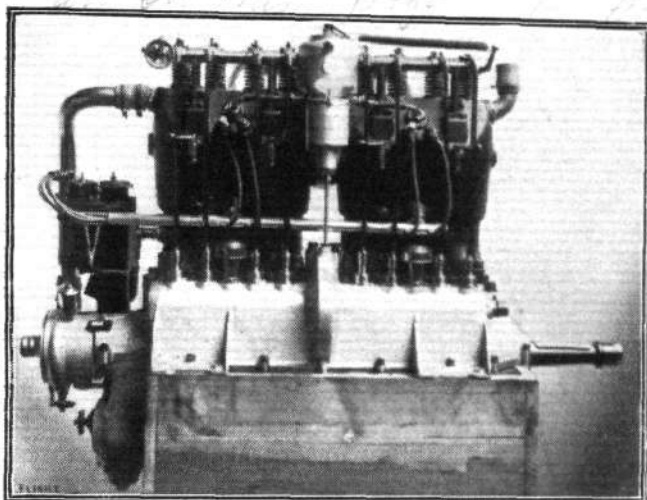
LAVIATOR.

Of these engines, which are built on the Dansette-Gillet system,

passes on to the big-end bearings. A gauge is fitted to indicate the pressure of oil to the pilot.

MERCEDES.

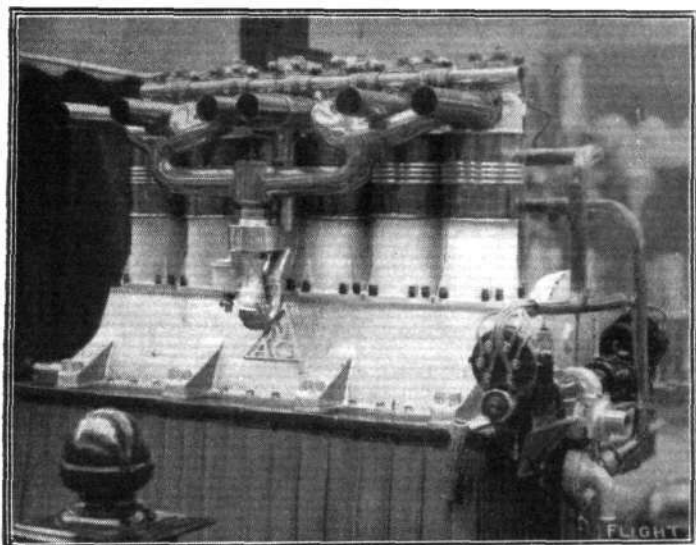
Messrs. Milnes-Daimler-Mercedes, of 132-5, Long Acre, London, W.C., show two of the 4-cylinder models and one of the 6-cylinder engines. All are of the vertical water-cooled type, the cylinders being cast in pairs. The valves are in the cylinder heads, and in the 70-h.p. engine are operated by push rods, but in the larger engines they are worked from an overhead camshaft which is gear driven. The carburettor is of Mercedes design, of the revolving sleeve type, and is fitted with an adjustable hot water heating device. Dual ignition is fitted to the 70-h.p., on which engine the water-pump,



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The 70-h.p. Mercedes engine.

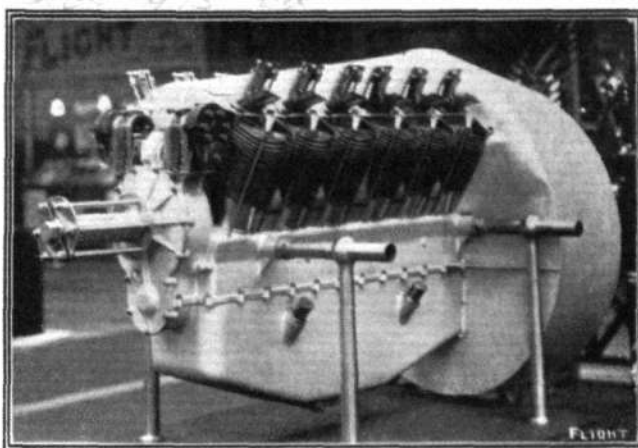
oil-pump and magneto are driven by one vertical shaft, an arrangement which offers very little wind resistance. On the larger models two magnetos are fitted. Lubrication is by forced feed, the oil tank



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The 150-h.p. N.A.G. motor.

being contained in the base chamber of the motor. The supply of oil is sufficient for a non-stop run of six hours, which, by the way, is guaranteed with all Mercedes aeroplane engines. All the working



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The 100-h.p. Renault motor.

parts of the motors are arranged on one side, this being very convenient for the making of any adjustments which may be necessary.

N.A.G.

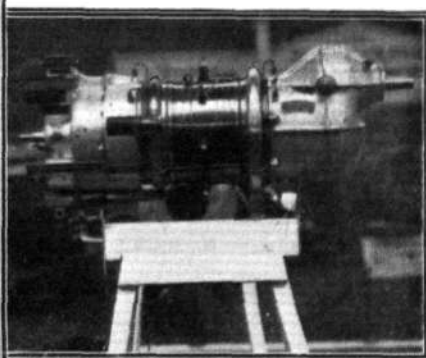
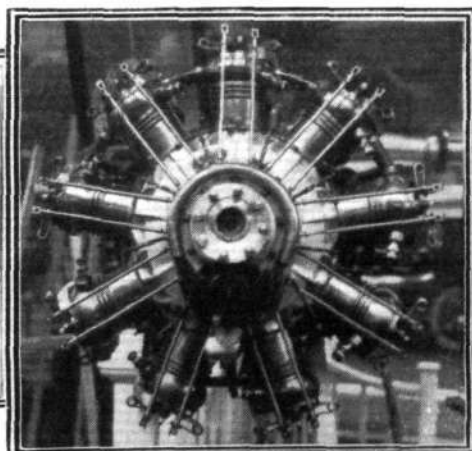
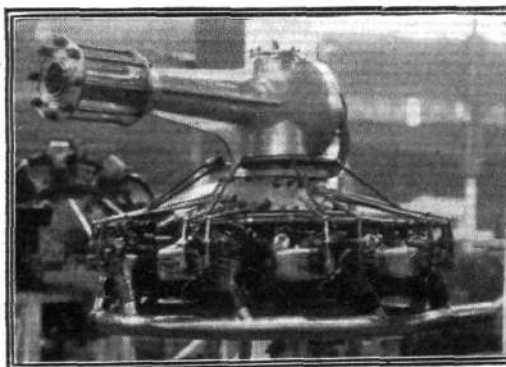
The British N.A.G. Motor Co., Ltd., 4, Great Marlborough Street, W., show two of their motors, a 4-cyl. engine of 55-h.p. and a six-cylinder one of 150-h.p. The separate cylinders are machined inside and out and fitted with sheet metal water-jackets. The inlet and exhaust valves are in the cylinder heads and the rocking levers which operate them are worked by push rods. A heating device is fitted to the automatic carburettor. In the larger engine, two H.T. magnetos are fitted on a transverse shaft behind the engine. A decompression lever is arranged for moving the cams on the camshaft, so that the engine may be easily started. A device is also fitted by which the exhaust valves can be held open, should it be desired, to stop the engine quickly. A special thrust bearing is arranged in the crankcase, which is a one-piece casting, thus making it very rigid. The lubrication is forced, a gear wheel pump drawing the oil from the tank which is fitted below the crankcase.

RENAULT.

Three types of Renault motors are shown by Messrs. Renault, Ltd., of Seagrave Road, West Brompton. Two have eight cylinders and the other twelve cylinders, in each case arranged V fashion, the former at an angle of 90 degrees and the latter at 60 degrees. The cylinders are air-cooled, and are covered with a bonnet into which cool air is forced by a centrifugal fan. The valves are superimposed and all worked from one camshaft; the inlet valves direct and the exhaust valves by a rocking arm.

SALMSON.

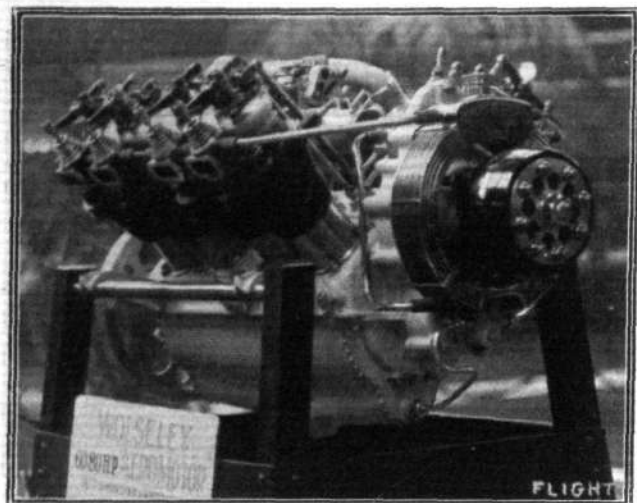
This exhibit comprises two very distinct types of motor, both, however, designed on the Canton-Unné system. In one type the cylinders are ranged radially round the crankcase; examples are on view of the 7-cyl. 85-h.p. and the 9-cyl. 110-h.p., one of the latter with the cylinders arranged horizontally, the propeller-shaft being driven by bevel gearing. These engines are fitted with a starting-



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THE SALMSON (CANTON-UNNÉ) MOTORS.—On the left the 110-h.p. engine placed horizontally, in the centre the 120-h.p. 9-cyl. engine, and on the right the special motor which has the cylinders arranged parallel to and round the crank-shaft.

ENGINES AT OLYMPIA.



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The 60-80-h.p. Wolsley motor.

handle. The other engine, of 60-h.p., is of unconventional design. There are seven cylinders arranged round and parallel to the shaft, and in each cylinder there are two pistons. The explosion takes place between them, and the result—motion is transmitted to the shaft by an arrangement of "wobble" gear. The cylinders are water-cooled, a brass jacket enveloping the whole arrangement, the water being thoroughly circulated by means of a centrifugal pump. As our photo shows, this system makes for a very compact engine.

Wolsley.

Of the three engines exhibited by the Wolsley Tool and Motor Car Co., Ltd., of Adderley Park, Birmingham, the new 60-80-h.p. 8-cyl. V-type motor has secured the greatest amount of attention. The cylinder dimensions are the same as in the old 60-h.p. type, $3\frac{3}{4}$ bore by $5\frac{1}{2}$ stroke, but they are separate and air-cooled. The exhaust valve-boxes are, however, water-cooled, the water being circulated from the tube radiator by a gear pump. Both inlet and exhaust valves are in the cylinder head and work on removable seats. The carburettor, which is mounted in the centre between the cylinders, is pressure-fed, the air pump being driven from the camshaft. Forced lubrication is fitted, the oil being continually circulated by means of

Name.	h.p.	Type.	Cyls.	Bore.	Stroke.	Revs.	Weight.	Price.
				mm.	mm.	per min.	lbs.	£
Anzani ...	30	V ...	3	105	120	1,300	121	160
	40-45	Radial ...	6	90	120	1,300	154	240
	50-60	" ...	6	105	120	1,300	200	320
	80	" ...	10	90	130	1,250	238	432
	100-110	" ...	10	105	140	1,200	308	536
Austro-Daimler ...	65	Vertical ...	4	120	140	—	255*	495
	90	" ...	6	120	140	—	360*	625
	120	" ...	6	130	175	—	450*	850
Benz ...	100	" ...	4	130	180	1,250	306	—
Clerget ...	50-60	Rotary ...	7	120	120	1,250	200	—
Gnome ...	50	" ...	7	110	120	1,200	167	—
	100	" ...	14	110	120	1,200	220	—
Green ...	30-35	Vertical ...	4	105	120	—	163	300
	50-60	" ...	4	140	146	—	298	400
	90-100	" ...	6	140	152	—	447	750
Laviator ...	80	V ...	8	100	130	1,200	320	—
	120	" ...	8	114	160	1,200	396	—
	250	Vertical ...	6	180	200	1,050	—	—
Mercedes ...	70	" ...	4	120	140	1,400	308	385
	90	" ...	4	140	150	1,200	400	510
	100	" ...	6	120	140	1,200	444	585
N.A.G. ...	55	" ...	4	118	100	1,600	192	—
	150	" ...	6	135	160	1,250	460	—
Renault ...	40	V ...	8	70	120	—	242	340
	70	" ...	8	96	140	—	397	480
	90-100	" ...	12	96	140	—	639	680
Salmson ...	85	Radial ...	7	120	140	—	—	—
	110	" ...	9	120	140	1,250	—	—
	60	Special ...	7	65	220	900	—	—
Wolsley ...	60	V ...	8	$3\frac{3}{4}$ ins.	$5\frac{1}{2}$ ins.	—	—	500
	60-80	" ...	8	$3\frac{3}{4}$ ins.	$5\frac{1}{2}$ ins.	—	—	—
	120	" ...	8	5 ins.	7 ins.	—	—	1100

* Including radiator.

rotary pumps of the tandem type. The other engines on view were both water-cooled. In the 60-h.p. the cylinders are in pairs, with aluminium water-jackets, while in the 120-h.p. engine, which is similar to those supplied to the Italian Government for dirigible work, the cylinders are separate and the water-jackets are of spun aluminium.

THE KING'S VISIT TO OLYMPIA.

THE Olympia Aero Show could not have been inaugurated in a more auspicious manner than that its first visitor should be no less a personage than His Majesty King George. His presence there on the opening day tells of the interest he holds for aviation, and by his action he sets his subjects a notable example, although we should have liked it to have gone a step further, by making a formal public opening of the Exhibition. His Majesty went to Olympia to acquaint himself with all the progress that aviation has made, to see for himself the important part that aircraft will play in wars of the future; his subjects should also go to Olympia while there is still time, and there learn the importance of this new science and industry, for it is to be feared that their knowledge of the subject is none too extensive.

And we venture to think that the example has already been well followed, for the attendances at Olympia since the opening day have been very satisfactory.

Among those present in the large hall on Thursday last, the day before the opening of the Exhibition, there were rumours in circulation that gave one to doubt if the King would be able to honour the Exhibition with his presence on the morrow. However, later in the evening came a semi-official report that the King would arrive on the following day at a quarter to three. And punctually to that time did he arrive, driving up to the Hammersmith Road entrance, where he was received by Sir Charles Rose, M.P., chairman of the Royal Aero Club, Mr. Roger Wallace, K.C., its past chairman, Mr. Harold Perrin, its well-known Secretary, and Mr. E. Manville, President of the Society of Motor Manufacturers and Traders. His Majesty was attended by Lord Charles Fitzmaurice, Lord Loch, and Major Clive Wigram. Inside Olympia there were comparatively few people present, for only a privileged few and those whose presence on the various stands was absolutely essential were in the building. In this way, the King was able to make his tour of the exhibits in perfect comfort. His attention was first drawn towards H.M.A.

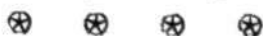
"Delta," the largest dirigible that the British Government has in its service, which is suspended from the roof of the exhibition. The King mounted the platform from which to view the car, and all its details were pointed out to him by Mr. Mervyn O'Gorman, the Superintendent of the Royal Aircraft Factory. He was shown how the balloon was made to rise and fall without loss of gas or ballast by changing the inclination of the propellers, how it was steered, and how the whole control of the vast machine was operated by the pilot from his comfortable seat in the nose of the body. The only detail that was not explained to him was the wireless telegraphy outfit by which, when the balloon is in flight, communication is kept up with headquarters. This apparatus had been dismantled from the car, for, naturally, it is not in the country's interest to make public such important details. Evidently vastly interested, the King passed on to the stand on which the two magnificent Bristol machines were shown. Here a detailed explanation of the machines was given by Sir George White and Mr. Thurston. Passing then to the stand of the Aircraft Manufacturing Co., he conversed for some time with Mr. Holt Thomas, the managing director of that firm constructing Farman aeroplanes in England. He was apparently much struck with the excellence of the finish of both machines, and had a remark to pass on the wind chart, exhibited on the stand, which recorded the strength of wind that was blowing at the time that Verrier started from Hendon to deliver a Maurice Farman biplane to Farnborough.

Engines next received the King's attention. He specially inspected the Green, the Renault, and the Gnome, and proceeded to the Handley Page stand, where it was explained to him by Mr. Page the system by which his machines are rendered, to a great extent, automatically stable. On the Royal Aero Club stand His Majesty became vastly interested in the neatly constructed models that were there exposed for exhibition. Mr. Harold E. Perrin explained to him their details. He was particularly drawn towards the model hydro-aeroplanes, and expressed a desire that he would

like to see them fly. Leaving that stand, he was shown more hydro-aeroplanes, but full-sized ones this time, on the stands of Messrs. Short Brothers, the British Deperdussin Aeroplane Co., the Grahame-White Aviation Co., and Messrs. J. Samuel White and Co. Mr. F. K. McClean, who was presented to the King at the Short stand, was congratulated by him most heartily on the magnificent performance he had accomplished in flying from Eastchurch up the river Thames into the very heart of London some months since on a Short hydro-biplane. Passing along, the King chatted with Mr. Grahame-White for quite a long time, and with him mounted the platform from which to view the details of the interior of the cockpit of the new Grahame-White military biplane. He was evidently particularly interested in that massive biplane, for on the following day he commanded Lord Knollys to convey his congratulations by

telegram to Mr. Grahame-White on having produced an aeroplane strictly for military purposes. Crossing one of the main aisles, he examined the 50-h.p. Avro biplane, the various points of interest of which were made clear to him by Mr. A. V. Roe, its designer and constructor. Thence the King proceeded to the War Office exhibits, the BE. 2 and the 120-h.p. Cody biplane. He chatted for some little while with the well-known constructor of that latter machine, for he had recollections of him, in the days when Mr. S. F. Cody was experimenting with man-lifting kites.

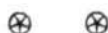
Before completing his visit the King visited the Vickers stand. Here again he showed the great interest that machines especially designed for military purposes possess for him, for of the two aeroplanes shown there, his attention was mainly directed towards the military biplane from the body of which protrudes a dangerous-looking Vickers automatic gun.



THE OLYMPIA INAUGURAL LUNCHEON.

PRIOR to the visit of the King to the Aero Show, an official luncheon was given by the Society of Motor Manufacturers and Traders in the Pillar Hall, Mr. E. Manville, President of the Society, presiding, a very representative number of guests being included amongst the visitors. Amongst those present were the Right Hon. C. E. Hobhouse, M.P., The Right Hon. J. A. Pease, M.P., Sir C. D. Rose, Bart., M.P., Major-Gen. R. M. Ruck, C.B., R.E., Brigadier-Gen. D. Henderson, C.B., D.S.O., The Right Hon. W. Runciman, M.P., Sir G. White, Bart., The Hon. A. Stanley, M.V.O., M.P., Major F. H. Sykes, Capt. G. Paine, M.V.O., R.N., Dr. R. T. Glazebrook, C.B., F.R.S., Commander C. R. Samson, R.N., Major E. Gerrard, R.M., Major C. J. Burke, Capt. J. D. Fulton, R.A., Capt. H. F. Wood, Lieut. A. Longmore, R.N., Messrs. F. W. Lanchester, Mervyn O'Gorman, M.I.C.E., Roger Wallace, J. W. Orde, S. F. Edge, C. Grahame-White, J. E. Hutton, E. M. C. Insone, C. Jarrott, G. Holt-Thomas, H. White-Smith, G. S. White, H. Coanda, H. J. Thomas, F. May, Handley Page, R. T. Gates, Stanley Spooner, H. W. Dover, A. E. Beriman, J. S. Matthew, &c.

Mr. Manville, in proposing the toast of "His Majesty's Aerial Fleet," after referring to the phenomenal success which aeroplanes had made since the first flight of the Wright Brothers, said that it was hardly surprising that, in view of the estimation in which aviation was held for warfare purposes, France and Germany were giving to it the close attention which they were now doing from the national point of view. On the other hand, we were practically standing still. The Germans, whilst possessing many aeroplanes, specialised in dirigible airships. France, while possessing dirigible airships, had specialised in aeroplanes. This country, while possessing few of either, had specialised, he might say, in delay. It was with the patriotic idea of educating the public that the Society had organised the Aero Exhibition, and were prepared to face the monetary loss which must be involved. They considered it was of the utmost importance that the public should recognise the national aspect of an exhibition of that sort, and that they should regard aeroplanes with something more than curiosity, and as more than the inventiveness of a few people, who had designed machines upon which others have killed themselves. Although we were undoubtedly suffering from want of aeroplanes in the Army and Navy, fortunately we did not suffer from want of capable men. He thought the Royal Flying Corps, as the nucleus of the new arm, was a first-class organisation, and everybody connected with aeronautics was very proud of it. They might flatter themselves that in that respect it was second to no other in the world. In both naval and military wings were men who were as great a credit to the country as any in the fighting forces. The same spirit, he was glad to say, prevailed in this as ever in the past.



AIRSHIP NEWS.

The New Clement-Bayard Airships.

THE "Clement-Bayard V" which has been built for Russia made a 22 minute trip on the 10th inst. On the following day she was put through speed and other tests during a cruise of some six hours over Villers-Cotterets, Compiègne, Pierrefonds, and Soissons. Among the 12 passengers on board were several representatives of the Russian Military Authorities. On the 12th the airship was cruising for an hour and a half at a height of over 2,000 metres, while on the 13th during a cruise of an hour and a quarter, the vessel carried 18 passengers. As soon as this vessel has been delivered, the sister ship, "Clement-Bayard VI" will be inflated and trials carried out.

The Right Hon. C. Hobhouse, M.P., in responding, said there was a note in the Chairman's speech about specialisation in delay, which he took as thrown out as a challenge to him, but he thought that in regard to a new industry delay had almost invariably brought with it the merit that we had been able to take the fullest advantage of the discoveries, the ingenuity and the activity of other people. Few people were aware of the very considerable amount of attention which had been given by the Government and by the War Office to the subject of aviation. He wondered if it was realised that in the Estimates for the year now closing the War Office had taken no less a sum than £400,000 for the provision and development of aviation. By this they would see that the War Office was not so far behind in its preparations as most people imagined. There could be no question that the successful defence of this country, and successful offence by this country, if ever the need should arise, would depend upon the mastery not only of the sea, but of the air and land as well.

Capt. G. Paine, M.V.O., R.N., in also responding, referred to the harmony with which everybody connected with the Central Flying School worked for the advance of aviation. During the nine months in which he had had the honour to command at Upavon, where there was every branch of the Service working together for the good of aviation, they had but one ambition. That was to see the aerial forces of this country take their proper place among the aerial forces of the world, and that place was the first place.

Brigadier-General D. Henderson, C.B., D.S.O., who also replied, said the soldiers and sailors looked to designers and builders of aeroplanes to continue improving their machines, so that they would become safer to the flying men and inflict greater damage on their enemies. He believed that in the present state of aviation constructors regarded the Admiralty and the War Office as their principal customers, but he feared that these departments had not been as good customers as they might have been; but they could only do with what was given them and what they were told to do. It must be remembered, however, that in the organisation of a flying corps a great many things had to be thought of besides the mere machines. Speaking as a soldier, he would rather take the field with a small flying corps that was well equipped in every detail than have to rely upon a multitude of aeroplanes of different designs, perhaps unproved, which they could neither man sufficiently nor maintain in the field. He regretted personally that there were not more British engines on view in the exhibition, as the lack of British aeroplane engines was a highly serious matter for both the Army and the Navy. He was glad to say that there were great hopes that many were now coming on, as they must have them somehow, and he hoped the Society would do everything in its power to encourage their design and production.



A Long Cruise by "Fleurus."

ON the 13th, the French Army airship, "Fleurus," made a cruise of over three hours from Versailles, with General Hirschauer on board.

Two New Clement Airships for France.

IT is announced that the French Government have ordered from M. Clement two big airships of 20,000 metres capacity. Each will be driven by four motors of 250-h.p., driving four propellers.

"Adjudant Vincenot" Along the Frontier.

ON the 12th inst., the military dirigible, "Adjudant Vincenot," made a long reconnaissance cruise along the German frontier from Toul, cruising over Le Haye Forest, Nancy, Moncel, Seille, Arracourt, Luneville, Manonville, and Baccarat. She returned along the Valley of the Meurthe over Lunéville and Nancy to Toul.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Committee Meeting.

A MEETING of the Committee was held on Tuesday, the 18th inst., when there were present: Sir Charles D. Rose, Bart., M.P., in the Chair, Prof. A. K. Huntington, Mr. F. K. McClean, Mr. Alec Ogilvie, Mr. Mervyn O'Gorman, Mr. C. F. Pollock, Mr. A. Mortimer Singer, Mr. R. W. Wallace, K.C., and the Secretary.

New Members.—The following new members were elected:—Richard Harold Barnwell, Lieut. A. Wellesley Bigsworth, 2nd-Lieut. A. Loftus Bryan, Lieut. J. E. G. Burroughs, Capt. J. C. Halahan, Lieut. Felton V. Holt, Capt. Hudson Lutwyche, 2nd-Lieut. Algernon G. Pearson, E. W. Copland Perry, and Lieut. Ralph M. Vaughan.

Aviators' Certificates.—The following Aviators' Certificates were granted:—

415. Assistant Paymaster E. B. Parker, R.N. (Short Biplane, Royal Naval Aviation School, Eastchurch).
416. Lieut. M. W. Noel (Caudron Biplane, Ewen School, Hendon).
417. 2nd-Lieut. R. M. Vaughan (Royal Inniskilling Fusiliers) (Bristol Biplane, Bristol School, Salisbury Plain).
418. H. T. G. Lane (Bristol Biplane, Bristol School, Brooklands).
419. F. F. R. Minchin (Bristol Biplane, Eastbourne Aviation School, Eastbourne).
420. J. Crawford Kehrmann (Bristol Biplane, Bristol School, Brooklands).
421. Capt. W. G. H. Salmond, R.F.A. (Maurice Farman Biplane, Central Flying School, Upavon).
422. Lieut. R. P. Ross, R.N. (Maurice Farman Biplane, Central Flying School, Upavon).
423. Lieut. J. R. B. Kennedy, R.N. (Maurice Farman Biplane, Central Flying School, Upavon).
424. George Lee Temple (Caudron Biplane, Ewen School, Hendon).
425. Lieut. D. A. Oliver, R.N. (Short Biplane, Central Flying School, Upavon).
426. Lieut. T. S. Creswell, R.M.L.I. (Short Biplane, Royal Naval Aviation School, Eastchurch).
427. Lieut. L. L. MacLean (Gurkha Rifles) (Bristol Biplane, Bristol School, Brooklands).
428. Jules Teulade-Cabanes (Blériot Monoplane, Blériot School, Hendon). Subject to permission of the Aero Club de France.
429. Lieut. R. G. D. Small (Leinster Regt.) (Grahame-White Biplane, Grahame-White School, Hendon).
430. Julian B. Hall (Bristol Biplane, Bristol School, Brooklands).
431. Lieut. C. F. Lee (King's Royal Rifles) (Bristol Biplane, Bristol School, Brooklands).
432. Percy Maxwell Muller (Farman Biplane, Ducrocq School, Brooklands).
433. Wallace Prowse Hodgson (Deperdussin Monoplane, Deperdussin School, Hendon).

The Committee decided that in the cases of Non-Commissioned Officers, Petty Officers and men attached to the Military and Naval Wings of the Royal Flying Corps, to dispense with the usual fee of one guinea for Aviator's Certificates, and only make a nominal charge of one shilling.

Annual Permits for Competitions.—Annual Permits for Competitions held under the Rules of the Royal Aero Club were granted to the Brooklands Automobile Racing Club for Brooklands Aerodrome and the Grahame-White Aviation Co., Ltd., for the London Aerodrome, Hendon, N.W.

International Aero Exhibition.

The invitation of the Royal Aero Club to the Non-Commissioned Officers and men attached to the Royal Flying Corps to visit the Aero Exhibition on Saturday last was much appreciated, and detachments arrived from Eastchurch, Farnborough, Larkhill and Upavon. The Chairman of the Club, Sir Charles Rose, had hoped to take the Chair at the luncheon, but owing to the fog he was unable to reach Olympia in time. In his absence, the guests were received by the Secretary, Mr. Perrin, and at the close of the visit, Sergeant-Major Squires proposed a hearty vote of thanks to the Club for its hospitality, which was carried with acclamation by his comrades.

The Club has since received letters from the Lords Commissioners of the Admiralty, Capt. Paine, R.N., Commandant of the Central Flying School, and Major F. H. Sykes, Officer Commanding the Military Wing of the Royal Flying Corps, expressing thanks for the Club's hospitality.

The Grahame-White Aviation Company will hold the first competition of the year at the London Aerodrome, Hendon, this afternoon, (Saturday), when a large number of prominent aviators will compete in a speed handicap for the Exhibition Trophy and cash prizes.

New Premises.

The Committee is actively engaged in endeavouring to find suitable premises for the Club. Many premises have been inspected, but up to the present nothing satisfactory has been found. The Committee will welcome any suggestions from Members who may hear or know of suitable premises.

Annual General Meeting.

The Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Wednesday, March 19th, 1913, at 4 o'clock, at 166, Piccadilly, London, W.

Notices of motion for the Annual General Meeting must be received by the Secretary not less than twenty-one days before the meeting, and must be signed by at least five members. Wednesday, February 26th, 1913, is the last day for the receipt of notices of motion.

Committee.

In accordance with the rules, the Committee shall consist of eighteen members. Members are elected to serve for two years, half the Committee retiring annually. Retiring members are eligible for re-election.

The retiring members of the committee are:—

Griffith Brewer.	Prof. A. K. Huntington.
Capt. Bertram Dickson, R.F.A.	F. K. McClean.
John D. Dunville.	Alec Ogilvie.
Col. H. C. L. Holden, C.B., F.R.S.	Mervyn O'Gorman.
	C. F. Pollock.

Any two members of the Club can nominate a member to serve on the Committee, having previously obtained such member's consent. The name of such member so nominated, with the names of his proposer and seconder, must be sent to the Secretary in writing not less than fourteen days before the Annual General Meeting. Wednesday, March 5th, is the last day for the receipt of nominations.

The following members have so far been nominated:—

Griffith Brewer.	F. K. McClean.
Ernest C. Bucknall.	Mervyn O'Gorman.
Col. H. C. L. Holden, C.B., F.R.S.	C. F. Pollock.
Prof. A. K. Huntington.	

Members are reminded that a ballot paper for the election of nine candidates to seats on the Committee of the Club will be forwarded to them at least seven days before the date of the Annual General Meeting.

ANNUAL DINNER.

The ANNUAL DINNER will take place at the ROYAL AUTOMOBILE CLUB, PALL MALL, S.W. (by kind permission), on THURSDAY, MARCH 13th, 1913, at 7.30 for 8 o'clock.

(Since circularising the members it has been found necessary to alter the date from March 6th to 13th.)

In order to facilitate the arrangements, Members are requested to notify the Secretary as early as possible, if it is their intention to be present, and at the same time give the names of their Guests, if any.

Members may be accompanied by Ladies.

Tickets (exclusive of Wines and Cigars)—15s. each.

The following prizes won during the year will be presented:—

The British Empire Michelin Trophy No. 1, to H. G. Hawker.

The British Empire Michelin Trophy No. 2, to S. F. Cody.

An entertainment will take place after the Dinner.

166, Piccadilly. HAROLD E. PERRIN, Secretary.

FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

FOG and bad weather notwithstanding, some very fine flights have been made from Brooklands during the week ending February 16th. On Monday, 10th inst., Mr. Raynham on the Coventry Ordnance biplane, carrying the official barograph, attained a recorded altitude of over 2,500 ft., at which height he cut off his engine and made a very fine *vol plané* descent. Mr. Barnwell made an excellent flight to Hendon and back in good time on the Vickers monoplane. Mr. Merriam first tested the air conditions on the Bristol biplane, and then presented two of his pupils, Mr. Lane and Lieut. Crawford-Kehrmann for their *brevet* tests, which they passed in good style. Mr. Merriam made excellent spiral descents from a height of over 2,000 ft. with engine stopped, being quite lost to sight in the clouds. Mr. Barnwell made some fine cross-country flights on the Vickers monoplane, attaining on one occasion an altitude of 4,000 ft. On the Saturday afternoon the fog and rain prevented any flying. Although on Sunday, 16th inst., the wind was too gusty to permit of the holding of the bomb-dropping competition, Messrs. Barnwell and Knight made some interesting cross-country trips on Vickers monoplanes. Mr. Hawker was out on the Sopwith biplane, and Mr. Merriam was flying solo and with pupils on the Bristol biplane. These flights were much appreciated by the large number of spectators present.

To-morrow (Sunday) the entries for bomb-dropping and alighting competition, postponed from last Sunday, are: Mr. Merriam and Mr. Bendall (Bristol biplane), Mr. Spencer (Spencer biplane), Mr. Barnwell and Mr. Knight (Vickers-Farman biplane), Mr. Hawker (Sopwith biplane), Mr. Raynham (Coventry Ordnance biplane), Mr. Sopwith (Sopwith biplane).

Bristol School.—On Monday last week, Merriam out for test and found the weather to be perfect, then up behind Lieut. Lee for four straights. Mr. Lane went up for the first part of his *brevet* which he passed in fine style. Lieut. Crawford-Kehrmann also went up for the first part of his certificate, flying exceedingly well at about 200 ft., finishing with a neat *vol plané*, and landing close to the observers. Bendall was out testing another machine.

After breakfast Merriam went up for test, then Lieut. Blatherwick made his first circuit, flying rather low, but his second was very much better, this pupil shows signs of great improvement. Mr. Lane then up for a flight with a good landing. This pupil then went out for the second part of his certificate which he passed in excellent style, finishing with an exceedingly good *vol plané*. Lieut. Crawford-Kehrmann then went out for the second part of his certificate, which he completed in first-class flying, banking very well, and finishing up by means of a *vol plané* with good landing.

Bendall up with Mr. Hall as passenger, afterwards this pupil was out for a couple of circuits. Merriam and Bendall finished the morning's work with a solo each, the former reaching a good

height and descending by means of a spiral glide with the engine cut off.

In the afternoon Merriam up for test, and then took Lieut. Robertson Dobie, a new pupil, for his first flight, reaching 1,500 ft. Lieut. Lee then took Merriam as passenger for two straights, then this pupil went out for several very good straights alone for the first time. After several landings he made two good circuits and half right-hand turns, and later made two more in very good style. Bendall then up with Lieut. Robertson Dobie for two flights, Merriam also up with this pupil, giving him control at times. Mr. Hall was out doing circuits and figures of eight, with good landings, Lieut. Blatherwick being out for two circuits.

Merriam went up twice to test an engine, afterwards taking Capt. Styles, an old pupil, as passenger. Bendall finished the day's work with solo flight to the sheds.

Merriam out for test of conditions on Tuesday, but found too foggy for pupils. Later tried again with Lieut. MacLean as passenger and found much better. Bendall out testing another machine. Lieut. MacLean was out doing figures of eight in fine style. Bendall testing engine, and then out with Lieut. Robertson Dobie. Afterwards Lieut. Blatherwick out for a couple of circuits, and Mr. Hall two figures of eight, and practising landings for his *brevet*. Lieut. MacLean doing several figures of eight, and also practising for his *brevet*.

In the afternoon Merriam out for test, and then sent Lieut. MacLean for his ticket, which he obtained in exceedingly good form, with excellent landings. Lieut. Lee then doing several figures of eight, and then he also took his *brevet* in excellent style. Everyone who saw these pupils taking their tickets said it speaks well for the Bristol way of instruction, and the pupils go away well satisfied. Lieut. Blatherwick and Mr. Hall each made a short flight, Bendall with Lieut. Robertson Dobie and Merriam finished the day's work with a spiral from nearly 2,000 ft.

On Wednesday the fog was thick all through the morning, but in the afternoon it cleared, and Merriam went for a test, taking Lieut. Robertson Dobie as passenger, afterwards giving him tuition trips. Bendall out for test and then with Lieut. Robertson Dobie. Mr. Hall practised for his ticket, which he afterwards took in first-class style, flying very high throughout tests, with perfect landings. This pupil is the fifth to take his *brevet* this week. Lieut. Blatherwick was then out for couple of circuits, but fog put an end to further school work.

After fog had cleared on Thursday, Bendall made test, afterwards giving tuition to Lieut. Robertson Dobie. Merriam out for solo, but thick fog came on suddenly and put an end to the morning's work. Merriam first out for solo in the afternoon, reaching 1,000 ft. He then gave tuition to Lieut. Robertson Dobie on landing, &c., who had the control at intervals, and will soon be ready to take the



The Curtiss Flying Boat, which has just been awarded the Collier Trophy for 1913.—This machine, it is claimed, will carry six passengers at a speed of 80 m.p.h. The Collier Trophy is awarded annually for the greatest contribution to the advance of aviation, and last year also it was awarded to Mr. Glenn Curtiss.

pilot's seat. Lieut. Blatherwick made two good right-hand turns. Bendall out for several circuits with Lieut. Robertson Dobie as passenger. Merriam made one more flight, and Bendall finished with a solo, gliding to hangars.

On Friday, thick fog prevented flying during the morning, but in the afternoon, after it had cleared a little, Bendall made a test with Lieut. Robertson Dobie as passenger, but found weather too bad for school work.

Merriam made a test on Saturday, after fog had cleared a little, then gave Mr. Archer instruction on spiral bank turns. Bendall then up with Lieut. Robertson Dobie for tuition. Lieut. Blatherwick, who has improved greatly, made a short solo. Mr. Archer did some landing practice, and figures of eight, and will try for the second part of his *brevet* at the next opportunity.

Merriam out with Lieut. Robertson Dobie in pilot's seat teaching pupil rudder control, &c., on straights. Merriam afterwards out with prospective pupil for a circuit.

Fog too thick in the afternoon for school work.

On Sunday, Merriam out for test, but found weather too bad. Later tried again, and found it much better. Bendall then up with Lieut. Robertson Dobie as passenger, but after one circuit came down, it being very gusty. Later Merriam took this pupil, but found conditions not good enough for further work.

Maurice Ducrocq School.—Ducrocq out on Monday morning last week for several circuits to test the air and see whether not too misty for pupils. Percy Muller who had only started on the Henry Farman 10 days before flew several circuits in grand style at 200 ft., landing several times on the mark with engine stopped.

Tuesday, Percy Muller out in the morning practising right- and left-hand turns, also landing on mark. Ducrocq out for a couple of circuits finishing with long glide.

Ducrocq, several short flights Thursday morning. Percy Muller after short practice flights in afternoon, passed the tests for his *brevet* in perfect style maintaining an even altitude of 300 ft. during his first five figures of eight and landing within a few feet of mark after each test. This pupil was particularly good, obtaining his "ticket" after a fortnight's tuition only.

Vickers School.—Monday last week, Barnwell on No. 5 in the morning out to Staines Reservoirs flying at about 3,500 ft. In the afternoon Barnwell doing cross-country on No. 5 for about an hour, going out of sight of aerodrome for 40 mins. Meanwhile Knight having tested No. 3, handed over to Mr. Lane, who made a number of very good straights, this being his first experience on a monoplane. On Barnwell's return Knight made a flight on No. 5, going over Byfleet and Ripley.

Fog prevented flying Tuesday morning. In the afternoon Mr. Lane flying straights on No. 3, while Barnwell and Knight exercised No. 5.

Mr. Lane made a number of very good straight flights Thursday in the afternoon on No. 3 mono., getting well off the ground, and landing excellently. Barnwell and Knight flying No. 5, but found fog too thick to venture far from aerodrome.

—Fog prevented flying Sunday morning. In the afternoon the wind being too high for pupil work, Barnwell, and later Knight, flying on No. 5, for the benefit of the Sunday crowd.

Eastbourne Aerodrome.

MESSRS. ROBERTS AND GASSLER were out on the Bristol on Wednesday morning, last week, doing circuits, and both made good progress. In the afternoon Fowler took Mr. Morkill in hand and gave him several instruction flights, during which he made excellent headway. Second-Lieut. Lerwill also put up a good flight, being up for about half-an-hour. About 3.30 p.m. Mr. Simms, of the Shoreham Aerodrome, arrived on an Avro tractor and landed in front of the hangars with a fine *vol plané*. Keeping over the sea the whole way, he did the 26 miles in just over 30 mins. After a short rest he commenced the return journey, but, unfortunately, his engine gave out before he had attained any height and compelled him to make a somewhat hurried landing. In doing so, the toe of his skid stuck in the ground, with rather disastrous results to the landing-chassis.

Thursday, although rather foggy, was an excellent flying day, and a lot of work was put in. At 11 a.m. Fowler started for a cross-country trip on his Blériot, but did not get far owing to fog. In the afternoon, Messrs. Roberts, Gassler, and Morkill all got in some practice.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Lieut. Small doing straights Monday morning last week on No. 7 under supervision of Mr. Manton. Mr. Lan-Davis hopping for half an hour on 2 B, under Instructor Cheeseman, later doing straight flights with Mr. Manton. Mr. T. Bayetto rolling on 4 B monoplane, later doing straights with Mr. Cheeseman. In the morning, Lieut. Small doing straights and circuits, making fine landings, Lieut. Hallows doing straights on

7 B, and all pupils taking it in turn on different machines, altogether a splendid day's work.

Tuesday, Mr. Power doing straights in good style under Instructor Manton on No. 7 machine, later also doing straights with Mr. Cheeseman. Lieut. Hallows doing straights on No. 5, carrying Instructor Manton as passenger. Lieut. Small doing straights and circuits on No. 5 'bus, afterwards passing his *brevet* tests and gaining his certificate in fine style, following which, pupils taking turn to fly the machines, and all making satisfactory progress. The rest of the week too foggy and windy to fly, pupils having to keep to the hangars.

Blackburn School.—School work commenced at 11 a.m. on Monday, last week, with a test flight of 15 mins. by Mr. H. Blackburn. Mr. Morris rolling for 10 mins., after which Mr. Spink had 15 mins. practice in straight flights. In the afternoon, after a test flight by Mr. Blackburn, Mr. Spink flew several straights, then went for a circuit for the first time, which he completed quite satisfactorily. Afterwards Mr. Morris had 20 mins. rolling practice, when darkness put a stop to work for the day. On Tuesday, in the afternoon, test flight by Mr. Blackburn, then Mr. Spink flew two circuits in good style, Mr. Morris rolling for 15 mins. and showing considerable improvement in his handling of machine. Wednesday and Thursday fog prevented any school work. On Friday afternoon Mr. H. Blackburn made a short test flight, and on Saturday, after a test flight by Mr. Blackburn at 7.50 a.m., Dr. Christie practised straight flights for 10 mins.

Blériot School.—Monday, last week, an excellent day's work was put in by nearly all pupils, MM. Gandillon and Teulade making especially noticeable progress, the former doing six circuits on LB 3 at about 80 ft., and the latter doing three circuits and a figure 8 on No. 3 at about 100 ft. Lieut. Loftus Bryan and Messrs. R. Desoutter and Clappen were all making good straights on LB 2, and Mr. Williams contented himself with rolling practice.

The following day was even better for school work—quite the best of the year so far, and after M. Teulade had made a brace of excellent eights on No. 4, he went aloft for his ticket, accomplishing the tests in very good style, and getting up to about 450 ft. during his altitude test, his landings also being noticeably good. M. Gandillon then took the same machine up to 80 ft. in a nice circuit, this being his first introduction to the *brevet* machine. Lieut. Loftus Bryan was doing good straights on No. 2, as were also Messrs. R. Desoutter and Clappen. Mr. Williams is making good progress on the taxi, and is shortly to be promoted to the "straight-flight" stage.

Lieut. Loftus Bryan and Messrs. Gandillon, R. Desoutter, and Williams were all at work on Saturday morning, until the fog came down again and prevented any more being done. M. Gandillon did a nice circuit on LB 4 at 100 ft., and the others were doing straights on No. 2.

British Deperdussin School.—On Friday, last week, when fog cleared, Mr. Spratt was out on No. 4 testing the air. Mr. Whitehouse then took over and flew some very good circuits, finishing up with a good *vol plané* landing. Lieut. Hawker then flew some right- and left-hand half-circuits, making neat landings. On Saturday, Mr. Spratt tested weather conditions, then sent Mr. Valazzi up for his *brevet* tests, which he passed. Lieut. Hawker took over machine, and first flew a couple of straights, then went up for his first circuit and figure of eight, which he did in excellent style, making a neat landing. Lieut. Hawker's performance was all the more creditable, as while in the air the fog came on suddenly.

Mr. Spratt had No. 4 out on Sunday afternoon for a few circuits.

W. H. Ewen School.—On Monday, last week, the school was out at 7.45 a.m., under the instruction of Mr. Lewis W. F. Turner and M. Baumann, when a long and continuous day's practice was put in. Messrs. Torr and Stewart made some splendid straights on No. 2 monoplane and made excellent progress. Mr. H. Gist several flights at 30 ft. on same machine. Mr. Lewis W. F. Turner was also busy with the 35-h.p. Caudron; after a test flight he handed the machine over to Mr. Lawford, who flew several circuits and figures of eight. After lunch, Mr. Turner put up a good exhibition flight on the 35-h.p. Caudron, finishing with a nicely judged *vol plané*. Mr. L. Lawford then started out on the same machine for his *brevet*, the first half of which he passed in a splendid manner. Mr. Warren was out later on the 35-h.p. doing some excellent circuits.

The fine weather continued on Tuesday and another full day's flying practice was put in; Mr. L. Turner, after a test flight on the 35 Caudron, handed the machine over to Messrs. McGregor and Zubiaga who put in an excellent forenoon's practice in straights. M. Baumann was also getting good results from pupils on monoplane No. 2. Messrs. Torr, Stewart and Prosser all making good progress in straights. After lunch all the above pupils were again out getting in some good practice and greatly adding to their experience. During the afternoon, Commander O. Schwann put up an excellent flight on the 35-h.p. Caudron, being in the air for

22 mins. and rising to nearly 1,000 ft. Mr. Lewis W. F. Turner made two exhibition flights on the 60-h.p. Caudron.

There was no school work on the three following days, the weather being too unfavourable, but on Saturday, the school was out at 9.50 a.m., and some good practice was put in by the pupils. Mr. Lewis W. F. Turner and M. Baumann were testing the machines and doing some fine exhibition flying. Messrs. Stewart, Prosser and Torr were making capital progress and doing fine straight flights on No. 2 monoplane. Lieuts. Bayly and McMullen were flying straights on the 35-h.p. Caudron biplane, and later Lieut. McMullen and Mr. L. Lawford each made several excellent circuits on the same machine. Mr. Lewis Turner put up some exhibition flying on the 60 Caudron. Mr. Turner was again out with the 60 Caudron on Sunday doing several exhibition flights.

Salisbury Plain.

Bristol School.—On Monday, last week, the weather was very favourable, with a slight S.W. wind. England was up for a test on biplane with Lieut. Vernon, afterwards taking Major Merrick to obtain observers for certificate tests. England was again out with Major Merrick for two biplane flights, and then for a solo in a 50-h.p. Bristol for 10 mins., winding up by giving Mr. Tower two biplane trips. Jullerot was occupied taking Major Merrick for a couple of trips in a biplane, and then twice in the side-by-side monoplane. Jullerot was out later for three solos in a 50-h.p. Bristol monoplane, reaching 1,000 ft., and flying round Amesbury with passenger and good load, remaining up altogether an hour, landing each case *en vol plané*, from about 900 ft.

Pixton carried out a couple of good flights on an 80-h.p. Bristol with England as passenger, afterwards making a solo in one of the Bristol tractor biplanes, and then with Jullerot as passenger for ten minutes at 600 ft. Pixton also took Major Merrick for an instructional flight in a biplane.

Mr. Tod put in close on an hour's practice at taxi-ing in a single-seater monoplane, finishing with a fine straight flight.

Lieut. Vaughan successfully completed the necessary tests for his certificate in really excellent style, proving himself a flyer of no mean ability. Mr. Smith Barry, an old Bristol pupil, was out for half-an-hour's practice, flying well.

Fog was the worst ever experienced, and flying was entirely out of the question all day Tuesday. Work was carried on in the hangars on the various new machines received from the works at Filton.

On Wednesday the usual tests found the weather to be quite good, and Jullerot was first out in a tractor biplane making wind circuit round Shrewton at 1,500 ft., then taking Lieut. Biggins in an 80-h.p. Bristol monoplane for a flight. England was out with Mr. Tod in the side-by-side monoplane, giving the pupil a long instructional flight. Jullerot was on a 50-h.p. Bristol monoplane, and set off with a passenger for a long cross-country trip to Devizes, arriving back at the hangars after a flight of 55 mins. Jullerot was later giving instruction to Major Merrick and Capt. Landon in a side-by-side monoplane, taking Major Merrick up in a biplane as well. England took Mr. Tod for a long flight in a 50-h.p. Bristol, landing after three-quarters of an hour. Major Merrick, Capt. Landon, and Mr. Tower were all taken by England for biplane tuition, Capt. Landon having three flights in all. England was also out for a circuit on a single-seater monoplane. Harrison took Capt. Landon for a 15 mins. tuition trip on a biplane, and Mr. Tod was flying quite good straights for over half an hour. Pixton took Major Merrick for a biplane trip and Mr. Tower made a good solo in a similar machine.

In the afternoon the fog abruptly put an end to the flying. England was first up in a biplane, and then Mr. Tod in a side-by-side monoplane, afterwards giving tuition to Major Merrick (2), Capt. Landon, and Mr. Tower. Pixton went up for his first trip in a side-by-side, and then up in a 50-h.p. Bristol tandem monoplane. Jullerot took Major Merrick for a trip in a side-by-side, and made the last flight of the day in a 50-h.p. monoplane.

Fog rendered flying quite impossible on Thursday morning, but weather in the afternoon cleared, and England was out for a test, taking Major Merrick up twice, and Capt. Landon and Mr. Tower, afterwards taking Capt. Landon for a flight in a 80-h.p. Bristol monoplane. Pixton gave Major Merrick and Capt. Landon two biplane flights each, whilst Harrison also took Capt. Landon. Jullerot made a 15 mins. solo on a tractor biplane, and then out on a 50-h.p. monoplane for half an hour. Mr. Tod was taken up by Jullerot in a side-by-side machine, also taking Capt. Landon in the same machine. Jullerot was also out for a solo on an 80-h.p. monoplane, finishing up with a 15 mins. solo on a 50-h.p. tandem monoplane.

Fog prevailed until Friday, when England took Capt. Landon for a 30 mins. flight, and Major Merrick for 15 mins. on a biplane. England was out for a trial in the afternoon with Mr. Tower, Pixton giving Major Merrick instruction, the pupil having good demonstrations of landing, &c. England took Capt. Landon.

Royal Flying Corps.—Wednesday of last week being a fine day for air work, the R.F.C. were out early. Lieut. Cholmondeley started on Maurice Farman 214 for a 50 mins. cross-country flight at a height of 3,000 ft., and on his return Lieut. Anderson took over the biplane and made a 40 mins. flight, scouting around the Downs. Lieut. Carmichael made three useful flights, Serjt. Ridd made two flights of 12 mins. and 7 mins. duration respectively. Very little work was done at the end of the week as the officers and a number of air mechanics were away at Olympia.

On Monday, Lieut. Cholmondeley was out testing the weather on Maurice Farman 216, and on landing reported that the winds were very treacherous, so work was carried on in sheds. The Dunne monoplane has been sent back to the works for alterations.

Shoreham Aerodrome.

Avro School.—Wednesday, last week, Simms out in morning testing tank adjustment on ENV Avro, later flew to Portslade and back, finding atmosphere foggy and bumpy. In afternoon air much better, Simms to Eastbourne, following coast at about 900 ft., ground being quite obscured at 1,200 ft. Getting away on return journey, a gudgeon-pin seized, forcing a landing on very soft ground, and machine folded up somewhat, though actual breakage was not great. On Saturday the 35 Green machine was out again being tested after repairs, but wind too bad for pupils.

Upavon (Central Flying School).

Royal Flying Corps.—Tuesday of last week was an ideal day for flying. On Avro 404, Air Mechanic Higginbottom gave instruction to Leading Seaman Marchant for half an hour. Lieut. Watter doing straights for quarter of an hour. On Avro 405, Lieuts. Holt, Marks, and Small flying circuits for about 20 mins. each. On Short biplane 402, Lieut. Oliver, R.N., made a good flight of one hour. Lieuts. Roupell, Bowhill, and Watkins all flying solos. On Maurice Farman 418, Major Gerrard took Capt. Tucker, and Lieuts. Glenville, Unwin, and Jenkins as passengers. Capt. Tucker flew two solos, and Lieut. Glenville one solo of 8 mins. respectively. Lieuts. Harvey, Marix, and Boyle flying circuits in good style on Maurice Farman 425. Lieut. Harvey with Capt. Fisher as passenger for one circuit of 12 mins. Capt. Millar made two good flights of a quarter of an hour each, and Capt. Salmond one flight. On Maurice Farman 403, Air Mechanic Collis made one circuit of 10 mins. duration. Lieut. Kennedy three flights, doing circuits in good style. Serjt. Stafford was up for 25 mins., and later for 15 mins. Capt. Lithgow made one circuit of aerodrome, and Lieut. Ross two good flights of half an hour each. Lieut. Longmore, R.N., was passenger-carrying on Maurice Farman 411, taking Capt. Lithgow twice, Capt. Fisher once, and Air Mechanic Collis twice. Lieuts. Burroughs and Randall flying circuits on Maurice Farman 428. Capt. Salmond made one flight of 12 mins. on same machine. Lieuts. Soams, Burroughs, Bigworth, and Arthur were all flying circuits in excellent style. Capt. Salmond with Lieut. Vernon as passenger, made a good flight of 40 mins.

On Wednesday there was a slight mist early in the morning which soon cleared. Lieut. Longmore made quarter of an hour flight with Commandant Paine, R.N., M.V.O., as passenger. On Maurice Farman 403 Air Mechanic Collis made flight of 15 mins., and Serjt. Stafford 25 mins. Lieut. Kennedy made three good flights of 18, 15 and 23 mins. each. Lieuts. Harvey and Boyle were flying solos of 5 mins. each. Capt. Salmond made a good flight of 17 mins., and Lieut. Ross two flights of 20 mins. each. On Maurice Farman 425 Capt. Millar and Salmond flying solos, and Lieuts. Conran, Marix, Boyle, and Harvey doing circuits. On Maurice Farman 418 Lieuts. Unwin, Glenville, and Watkins all flew one circuit each. Capt. Tucker two solos of 8 mins. each. Major Gerrard, with Lieut. Watkins as passenger, flew one circuit. On Avro 404, Lieuts. Holt and Marks made one circuit of aerodrome. Leading Seaman Marchant flying straights for 10 mins. On Short biplane 402 Serjt. Vagg was doing circuits in excellent style, being in the air for 45 mins. Lieuts. Bowhill, Oliver, and Roupell were doing circuits of 15 mins. each. Lieut. Burroughs flew three circuits of 8 mins. each, and Lieut. Arthur made an excellent flight of 1 hr., reaching 2,600 ft.

On Thursday a very heavy mist was hanging over the Plain all day, making it impossible to fly. On Friday and Saturday there was no flying, as two days special leave was given to all the staff and men under instruction, to enable them to visit the Aero Show at Olympia.

On Monday there was very little flying, as the air was very bumpy. Three machines were flown from Farnborough—Major Gerard, R.M.L.I., flew the Short tractor biplane 424, Major Trenchard the Maurice Farman 426, and Lieut. Conran the Maurice Farman 427. All three had rather rough voyages, as the wind was very strong. On Avro 404 Lieuts. Small and Littleton each flew one circuit, and Capt. Fulton one circuit. On Maurice Farman 403, Air Mechanic Collis flew one circuit of Aerodrome, finding it very bumpy. Lieut. Longmore, on Maurice Farman 411, one circuit of 10 mins.

BRITISH NOTES OF THE WEEK.

R.F.C. Flight to Montrose.

THE five Army pilots actually started their journey to Montrose on the 13th inst., but their progress was not very great, mainly owing, of course, to the very bad weather experienced. The pilots were Capt. C. A. H. Longcroft, J. H. W. Becke, and G. W. P. Dawes, and Lieuts. F. F. Waldron and P. W. L. Herbert, the two first being on B.E. biplanes, and the others on Maurice Farman machines. The first stop was to have been Towcester. Three of the pilots landed at Reading, while the others returned to Farnborough, the fog making it impossible to go forward. A fresh start was made on Monday, and Capt. Becke reached Towcester from Farnborough, after making a stop at Blakesley for petrol. Capt. Longcroft, who had started from Reading, landed about 3 miles west of Oxford. Lieut. Waldron, who started from Farnborough came down at Port Meadow, Oxford, and Capt. Dawes reached Banbury. Lieut. Herbert started from Reading and landed at Moreton-in-the-Marsh. In each case a descent had to be made for petrol. On Tuesday, Lieut. Herbert went on a few miles to just by Banbury.

Special Training for R.F.C.

ON April 1st the squadrons of the Royal Flying Corps stationed on Salisbury Plain will commence a special course of training in conjunction with the Royal Field Artillery and Siege Artillery Brigade.

New Military Aviation Centres.

IT is reported that the Government intends to establish a naval aviation centre on the western side of the Isle of Wight, near Golden Hill Fort. Two other likely places are at Kingnorth and Dungeness in Kent.

Mr. Hucks at Newcastle.

DURING last week some splendid flying was done at Newcastle by Mr. B. C. Hucks on his Blériot, but Novocastrians did not display any very great enthusiasm. The attendance at Gosforth Park was disappointing, but at the various places visited, Consett, Ashington, Blyth, Seaham Harbour, &c., the aviator was invariably received by a big crowd, and at some places it was difficult to keep a clear space for the aviator to land. This week Mr. Hucks was to visit Pelton, Stanly and Tynemouth, and will give exhibition flights at Gosforth Park to-day when it is hoped the attendance will be more encouraging.

Visitors to Olympia.

ON Tuesday afternoon a number of the members of the Advisory Committee on Aeronautics, including Mr. Mervyn O'Gorman, Dr. R. T. Glazebrook, Mr. Frank Lanchester, paid an official visit to Olympia. Other distinguished visitors during the afternoon were Col. Seely, Secretary of State for War, Brigadier-General Henderson and Mr. Orville Wright and his sister.

Hendon Season Commences.

WITH the special meeting arranged for to-day, Saturday, at the London Aerodrome, Hendon, the 1913 season there can be said to have commenced. There is every indication that it will prove an even more popular rendezvous than last year, and we would remind our readers that they can obtain fixture lists and season tickets from the London Aerodrome offices at 166, Piccadilly, W.

Mr. Hamel at Uppingham and Oundle.

MR. HAMEL'S visit to Uppingham, on Wednesday of last week, resulted in most of the shops in the town being closed for about an hour in the afternoon. Three trips were made, one of them to a very good height, and on his descent each time the aviator was heartily cheered by the 5,000 people present. On Saturday Mr. Hamel was at Oundle, and again made three ascents on his Blériot machine.

The Flight of Birds.

AN important work in connection with the flight of birds is being conducted by readers of *British Birds*, who up to the present have placed identification rings on 32,000 wild birds of various kinds and then liberated them. It is hoped that should any of our readers come across any of these birds they will communicate Mr. H. F. Witherby, Editor of *British Birds*, at 326, High Holborn, London, W.C., giving the particulars on the ring and the locality where the bird was found, so that it may be identified.

A Long Flight.

PERHAPS the most interesting result up to the present is that a swallow ringed, at Rosehill, Cheshire, Staffordshire, on May 6th, 1911, was caught on December 23rd, 1912, at a farmhouse at Roodeyand, 18 miles from Utrecht, Natal, so that the bird must have travelled.

QUESTIONS IN PARLIAMENT.

THE Secretary for War was asked by Mr. Hunt, in the House of Commons last week: Whether he was aware that Germany has five military airships of the rigid type of large size, capable of being safely used at night, and of carrying and of discharging quantities of high explosives on to our docks, ships, magazines, and stores; whether we have any airships of more than one-third of the size of the smallest of these five German airships; if he could say why the Government neglected to build large airships; and what steps he proposed to take to guard against the danger of our deficiency.

Col. Seely: The reply to the first and second parts of the question is in the affirmative. With regard to the last part, it is not considered desirable to make public the steps which have been and are being taken.

Mr. Hunt: Is it not true that the Government have neglected to provide airships, and that we are at an enormous disadvantage in comparison with Germany, and that there is danger we might have our magazines, stores, and ships blasted with explosives from airships, and have nothing to protect them?

Col. Seely: The fact that we have not supplied large airships does not imply neglect.

The Aerial Navigation Act.

THE Bill amending the Aerial Navigation Act passed through all its stages in the House of Lords on the 13th inst. and on the following day received the Royal Assent.

In the House of Commons last week Mr. Booth asked the Secretary for War whether, in view of the public interests involved in the passage of the Aerial Navigation Bill, and the possible developments of the new science, he would undertake that any regulations made under the Bill should be subject to annual review by the Department of State making the regulations.

Mr. Tennant (Under Secretary for War). The answer is in the affirmative.



NEW RECORDS.

Another Passenger Height-Record.

NO doubt inspired by the exploit of his confrère Gougenheim in beating the height-record for pilot and four passengers, Chevillard, on the 12th, also at Etampes, has beaten the record for pilot and three passengers, going up to 1,350 metres. He started at 3.50 p.m., and in half an hour had reached a height of 1,000 metres. He climbed slowly on until the barograph indicated 1,350 metres and then feeling that Hirth's old record of 1,100 metres was well lowered he decided to come down, as the fog was getting thicker and more troublesome. The machine was a Henry Farman with 80-h.p. Gnome motor and Chauvière propeller. On January 11th last Chevillard took three passengers up to a height of 1,500 metres, but as it was not officially controlled, the Aero Club of France could not recognise the performance.

Guillaux Beats Speed Record.

HALF-A-DOZEN records were made by Guillaux during his fine flight on the Clement-Bayard steel-framed monoplane at Etampes on the 11th inst. Having flown over from Issy on the previous evening, when he covered the 60 kiloms. in 32 mins., the pilot made an early start at 7 a.m., but owing to the mist he decided to wait a while, and so it was not until mid-day that the actual record flight was commenced. With his passenger, Bruyere, Guillaux started at four minutes past twelve. The course was of 10 kiloms., marked out by six pylons, and when the tenth round had been completed, it was found that the time, 1h. 2m. 10s., was a good deal longer than the record, 44 mins. 36½ secs. of Legagneux. At 200 kiloms., however, the time was 2h. 4m. 27s., some 8 mins. outside the record, while for 250 kiloms., Guillaux was still outside. Thereafter, however, he beat the records up to 400 kiloms., and finished his flight in 4h. 10m. 45s., having covered 41 laps, or 410 kiloms.

New world's records made were 300 kiloms. in 3 hours 4 mins. 5 secs., 350 kiloms. in 3 hours 34 mins. 46 secs., and 400 kiloms. in 4 hours 4 mins. 4 secs. Records were also made for 3 hours with 291'9 kiloms., and 4 hours with 391'9 kiloms. The monoplane was fitted with a 60-h.p. Gnome engine and Chauvière propeller.

A German Passenger Record.

FLYING at the Habsheim Aerodrome, near Mulhausen, on Sunday week, a new world's record was made by Faller taking five passengers on the Aviatik biplane, and flying for 1 hour 10 mins. 17 secs. The weight of the six persons carried represented 818 lbs. Of the half a dozen world's records at present held in Germany, five were made by Faller, and they are all of the passenger duration class.

FOREIGN AVIATION NEWS.

Mdlle. Dutrieu Honoured.

It was officially announced on Monday that Mdlle. Helene Dutrieu had been nominated as a Chevalier of the Legion of Honour, and she thus secures the distinction of being the first woman pilot to be so honoured.

Maurice Farman's Sunday Trip.

THE passenger with Maurice Farman for his usual cross-country trip on Sunday last was M. Brancel, and they arrived at Chartres, from Buc, in time for lunch. They made the journey *via* Rambouillet and Gallardon. On the return journey, in the afternoon, they made a wide detour.

An Irish Flyer at Pau.

ON Monday, Mr. Corbett Wilson, who is staying at Pau, made a very fine flight on his new Blériot from Pau to Orthez and back. A trip of over two hours' duration was made over the Gaye Valley on the 14th.

Lieut. Boothby Takes His Ticket in France.

ON the 13th inst., Lieut. Boothby, R.N., who has been training on the Farman machines in France recently, made the *brevet* tests in fine style at Buc.

New Farman Superior Pilots.

ON Sunday a non-commissioned officer, Damberville, on a Henry Farman machine, made one trial for a superior *brevet* over a course from Chalons Camp to Douai and back. On the previous day Le Maître made one of the tests, flying from Etampes to Tours and back, the speed being 105 k.p.h. on the outward journey.

Fine Work at Caudron School.

SOME fine flying was seen at Crotoy on Saturday last, when Lieuts. Gerard and Bihan and Sapper Jacquemart were flying for a long time over the Bay on 70 h.p. machines. Galtier made a cross-country trip of 75 miles on a biplane with 25-h.p. Anzani engine. Henry Farman was also at Crotoy in the afternoon, and flew on his hydro-aeroplane, with Fischer, to Boulogne.

Garros After More Height Records.

GARROS is now staying at the California Aerodrome, near Nice, with the intention of making an attempt at the first favourable opportunity of beating the height record for pilot and passenger. On the 12th inst. he was at a height of 2,000 metres, and reported that he could see the coast of Corsica quite plainly.

Long Flight on Caudron.

ON the 11th inst. at Rheims, Duval on his Caudron biplane, which is fitted with one of the new Clerget rotary motors, flew with a passenger for 2 hrs. 7 mins., finishing up with a fine *vol plané* from a height of 1,000 metres.

The Farman Hydros at Boulogne.

DURING last week-end, Mr. Henry Farman was busy at Boulogne with the arrangements for the Farman hydro-aero centre there. On Saturday, the famous pilot and constructor arrived from Crotoy with Fischer on a hydro-aeroplane, and they were received by representatives of the town and the Boulogne Aero Club. Between 4 and 6 p.m., several flights were made by Henry Farman and Fischer. A good many trips were made on Sunday, and

although the sea was choppy, the machine alighted faultlessly each time.

Miss Davies Flies from Issy to Dieppe.

ON her new Blériot monoplane piloted by Mr. Valentine, Miss Trehawke Davies started from Issy on Saturday afternoon. On account of wind and mist it was decided to stop at Rouen, and on Sunday the journey to Dieppe was completed, the distance from Rouen to Dieppe being covered in 40 mins. The machine was then dismantled and put on the cross-channel steamer.

A Blériot Given to French Army.

THE French Minister of War has accepted for the French Army a 50-h.p. Blériot type XI monoplane, presented by M. Baschet, director of *L'Illustration*.

What Germany Will Spend.

IT is reported on very good authority that when the new Army bill is submitted to the Reichstag after Easter, it will be found that the estimates for the further strengthening of the Army's Aerial Fleet will total to something like £1,000,000.

The Prince Henry Cup.

THE main lines for the competition of the Prince Henry Aviation Cup have now been decided on. On May 11th the competitors will fly from Wiesbaden to Cassel, a distance of 165 kiloms., with a landing at Giessen, and on the following day they will go to Coblenz, a journey of 170 kiloms. May 13th will be a rest day, and on the 14th the journey will be to Carlsruhe, 200 kiloms. Reconnoitring tests will be made on the 16th and 17th, competitors being set to find troops between Carlsruhe and Stuttgart and Stuttgart and Strasbourg, respectively.

Fatalities in Germany and Austria.

ON Saturday, Lenk, the postal official who recently secured his pilot's certificate, and was to have been employed on aerial postal service in the German colonies, met with a fatal accident near Leipzig. He was gliding down from a height of 800 metres when the machine suddenly dived and became uncontrollable.

A fatal accident occurred near Tegel, on Monday, to the aviator Prizenski.

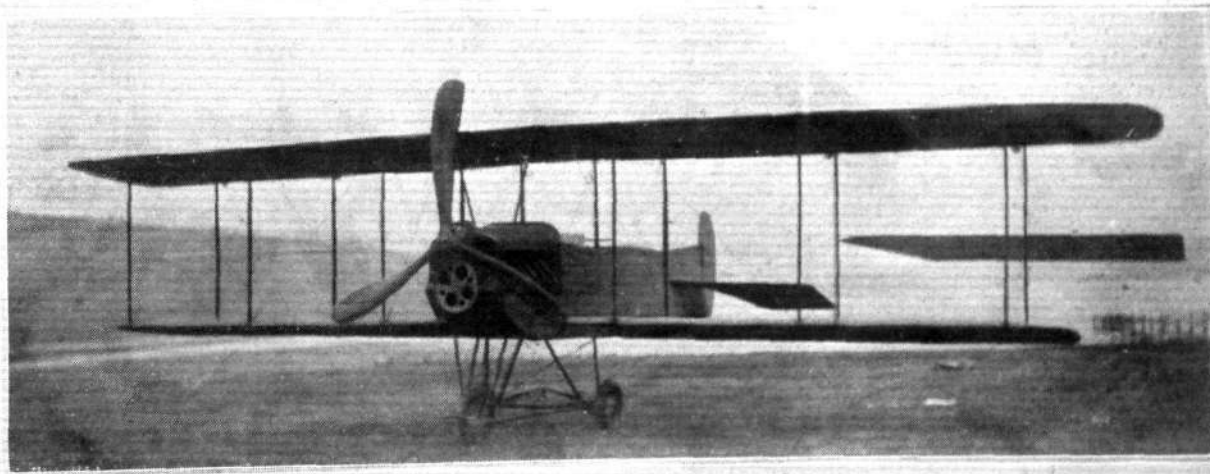
While flying at the Fischamend aerodrome, near Vienna, on Monday, the machine of Lieut. Mittner dived to the ground from a height of 300 ft., and the pilot was instantly killed.

Another Royal Pilot.

PRINCE AXEL of Denmark, who is a nephew of Queen Alexandra, and who has been actively interesting himself in aviation for quite a long time, made the necessary test flights to obtain a pilot's certificate on Wednesday of last week at the aerodrome near Copenhagen. The Prince is a naval lieutenant, and will pilot one of the new hydroavions, ordered in France by the Danish Government, as soon as they are delivered.

A Spanish Prince on a Blériot.

WHILE some military manoeuvres were being carried out at the Four Winds Aerodrome, Madrid, on Monday, Perreyon had the honour of taking the Infanta Alphonse of Spain on his Blériot over the assembled troops. Col. Vives Y Vich was also carried for a trip.



THE LATEST CURTISS BIPLANE.—It will be noticed that, as distinct from former Curtiss practice, this machine, which has been chiefly designed for military scouting, has a three-bladed tractor.

STABILITY DEVICES.

By MERVYN O'GORMAN.

(Continued from page 197.)

28. Since the aeroplane's weight is to be considered constant, the aeroplane must move so that the mean angle of incidence of the main wings is appropriate to the speed, and it would appear from this as though the angles of the flaps and wings combined must of necessity be equal and opposite, thus rendering the balance of drag impossible in this manner, or at least only instantaneous. The flaps

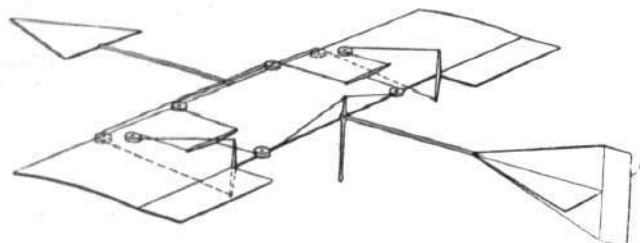


Fig. 6.—Gregory's device for securing symmetry of air resistance between the wings of an aeroplane even when warped.

controlled by Gregory's wiring would then be expected to become unstable or inoperative.

However, during the period when the outer wing requires the larger angle of incidence, the aeroplane's mean attitude is not the mean attitude appropriate to its weight and general speed of travel.

The wings may have an attitude different from that because we now have an extra load—the load of giving rotational acceleration to the whole aeroplane, not necessarily round its centre of gravity. [It, presumably, was not round the centre of gravity where, in old days, the flaps were not cross-connected.]

29. The period of giving rotational acceleration is the whole period of active warping—when that is completed, warping is no longer needed to give lift to the outer wing, and the aeroplane remains banked if travelling straight or tends to overbank with straight wings if on a curved path.

As a rule when banking is achieved, the aeroplane is moving in a circular path over the ground, and we desire that the wings should move at such an air speed that they have an equal normal reaction (or lift), fins being provided to look after the overbanking tendency. In exemplification of the effect of the Gregory device in this direction, when the warp lever of the model is fixed over to one side and exposed to fan draught, the model banks and remains banked without yawing towards what would usually be the wing of greater drag, and the flaps are not unstable. If, however, the differential arrangement be put out of action and the process repeated, the model banks, but yaws round to the side of greater drag. The pivots are taking care of the fin reactions.

30. The whole business of yawing, banking and changing the course of an aeroplane is most intricate, and I am glad to see Mr. Berriman arousing interest in this question by his recent articles in FLIGHT. In examining any device it is essential to consider its effect on every operation constituting a turn. If it introduces an undesirable couple, moment or force at any point it must be regarded with suspicion.

Asymmetry of Head Resistance.—Many usual aeroplanes, notably monoplanes and probably waterplanes have an excess of head resistance below the axis of symmetry of the fuselage—supposed to contain the c. of g.—or nearly, owing to the alighting chassis wheels, warping gear, &c. When the air speed becomes high this gives rise to an important diving moment, which is bad and aggravates the diving couple due to the movement of the centre of lift towards the trailing edge of the wings.

A dangerous case may occur when an aeroplane descends by diving with a down-current and emerges therefrom at the foot of the descent—an incident which we are not entitled to say shall not occur in cross-country work. If the elevator plane alone deals with this a pressure of 100 lbs. at the extremity of the tail of a well-known machine will be required to counteract the upsetting couple, apart from the effort required to "straighten out." If we cannot yet overcome the travel of the pressure resultant we can at least study symmetry of head resistance to begin with. Head resistance above the axis might even be invoked to counter the other trouble—it in fact acts in the right direction in an aeroplane with which I am familiar.

All devices arranged to keep an even keel in the face of irregularly distributed wind gusts must be put through the fire of this particular test, the test of an imaginary side-slip, and note the result.

Generally they are scorched. This leads us to consider "Horizontality Maintainers."

31. **Horizontality Maintainers.**—Many of the enthusiasts for this particular method of always countering the pull of gravity, have concluded that a hanging weight may be said to "know" better than the flyer does, the direction of the earth below them. They have accordingly called in the aid of pendulum devices.

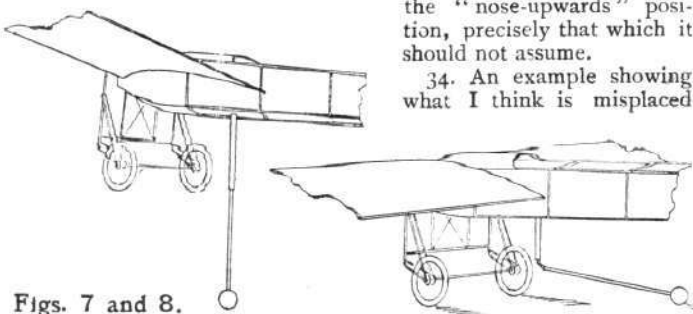
32. **Category A.**—The majority of these are of an extreme simplicity, and are produced in disregard of the facts:—

- (i.) That when the mass of a pendulum is being accelerated it is no longer only subject to the directive force of gravity, and
- (ii.) That the string of a freely suspended mass does not hang down the vertical when the point of suspension has a sideways acceleration or retardation.

They are not worth a decimal point, and my excuse for mentioning them is that they are recurrent decimals.

33. **Category B.**—Where the effects of centripetal acceleration on turning are recognised, merit for the improved device is claimed from the fact that the mass hangs down the line of the resultant of the acceleration due to gravity and that due to centrifugal force. In certain cases good flying is certainly effected with aeroplanes in which this principle is given value—machines with an abnormally low centre of gravity intentionally so placed, like the Pischoff, &c., and most water-planes whose centre of gravity is (with reluctance by the designer), lowered owing to the mass of the floats, or when it is deliberately lowered in the hope of getting better sea-worthiness, are examples of the category. In one set of flying conditions a low c. of g. undoubtedly gives an advantage, but on the whole, I think the flying is creditable to the pilot who has managed so well in spite of the device. Not the least of the incidental disabilities introduced is the fact that whenever the engine ceases to pull, or diminishes its pull, the low weight tends to elevate the aeroplane to the "nose-upwards" position, precisely that which it should not assume.

34. An example showing what I think is misplaced



Figs. 7 and 8.

ingenuity is W. S. Laycock's (Fig. 7), using a very low mass rigidly connected to the aeroplane by a sliding tube device arranged to become flexible (Fig. 8), on landing.

35. Nevertheless we must beware of condemning devices which we may admit to have good points only because they are defective in other respects. The question is, can we eliminate the evil? The longitudinal pendulum, for instance, in the event of an up-gust can be made to turn the elevator down, and *vice versa*. It is true that in the event of the engine accelerating, the same pendulum linkage will so turn the elevator as to aggravate the tendency to rise, and if the engine stops it accentuates the declivity of the fall. Both are objectionable, the latter to a serious extent. (The angle of the pendulum shaft will, at the moment of engine stoppage, be about 80° with the horizontal or perhaps 75° with the axis of the aeroplane on its gliding path, corresponding inevitably to a very large elevator movement if the ordinary small angles of the pendulum are to have any effect.)

36. **Renauld's Bob-weight Device.**—As a cure Major Renauld (November 15th, 1912) suggests subjecting the pendulum bob to two forces, the one always proportional to the propeller thrust and the other to the aeroplane's total head resistance. These forces are on a reduced scale so that they bear to the weight of the bob the same ratio as the real forces bear to the full weight of the aeroplane. The mimic head resistance force he gets from a small plane exposed to the wind of motion, the mimic thrust force he gets by any of the methods employed for measuring propeller thrust and duly transmitted to the bob. Then (i.), when the forces are equal the aeroplane has constant speed and therefore a vertical pendulum is obtained which is correct. (ii.) When the flight path is inclined to the horizontal, say downwards, and when [for constant speed] the engine pull is diminished, the same gravitational acceleration acts on the aeroplane and the bob.

(To be continued.)

Models

Edited by V. E. JOHNSON, M.A.

The Aero Show.

"WONDERFUL! wonderful! I should like to see them fly."

Such are the words which the King is reported to have said with respect to the model hydro-aeroplanes on his visit to Olympia, where the model aeroplanes and hydro-aeroplanes occupied his Majesty's attention for a considerable time—more especially the latter, which he pushed along the surface of the water in order to investigate their method of flotation, &c. He could scarcely believe that the model hydro-aeroplanes could rise from the surface of the water with no more propulsion than a twisted skein of rubber.

We certainly trust that this interest displayed by his Majesty will not be without its effect in certain quarters where "models" can scarcely be said to be appreciated.

Brief Summary of the Exhibits.

The exhibits include 8 in Class I—power-driven models; no less than 74 in Class II. A, *i.e.*, rise off the ground models; only 21 in Class II. B, *i.e.*, hand-launched models—a type of model which we quite expect to see practically non-existent at future exhibitions; 21 in Class III., *i.e.*, hydro-aeroplanes; 41 in Class IV., scale models or parts; and finally 6 in Class V., power plant for models, *i.e.*, 171 in all, the exhibits being, as we prophesied a week before the exhibition opened, the finest collection of *practical* models ever yet exhibited. That out of 171 exhibits only 21 should be hand-launched models is one at which it would be idle to pretend we do not feel especially gratified, also that so many tractors should be amongst the competitors. For instance, one club shows seven models, all of rise off the ground type, of which no less than six are tractors.

Gearings, generally twin, are quite common, and it will be interesting to see how these acquit themselves in the flying tests; another extremely interesting fact is that a French Model Flying Club is among the competitors—it is certainly to be hoped that they will be able to compete in the flying tests at Hendon. Curiously enough, nearly all their models are of the Canard or elevator in front type. A very brief examination of the exhibits is sufficient to show the pains and care that have been taken in the actual building of the models. Some of them are obviously constructed by far less experienced workmen than others. Some have evidently had many tools at their disposal combined with a knowledge of how to use them to the best advantage, whilst others have been strictly limited both as to tools and experience, and before condemning the workmanship of any model exhibited, such

an allowance should undoubtedly be made. At no previous exhibitions have we seen so few models which the exhibition would be better without. It might be worth while, however, just to mention that in future, when any intending exhibitor obviously purchases a considerable number of the various parts of his model, the parts which he *does* make, should possess a sufficiently high standard of workmanship to stand some sort of comparison with the purchased parts. Whereas there is undoubtedly a great diversity in the various types of models shown, in the main they run along already well-grooved lines and it is obvious that not a few of the exhibitors have had one eye very carefully glued on the 30 seconds qualifying test whilst designing and building their models. If this has adversely affected originality it is decidedly unfortunate, for the very last thing which we want is anything in the nature of stereotyped models.

We must confess to some feeling of disappointment at the hydro-aeroplane models. The effect of the models floating upon the water in the tanks is, as we felt sure it would be, a feature which attracts universal attention and interest, and to one who has not closely followed the very brief history of the subject, the exhibits leave nothing to be desired save perhaps a little more "sea worthiness" with respect to the floats. The feeling of disappointment arises when one compares the models there exhibited with those in vogue, say, six months ago; practically speaking in most cases but little, if any, advance is shown.

In this branch of aviation there is obviously immense scope for originality and invention, and, save in two or three cases to be dealt with in detail later on, we must confess we can find but little evidence of its existence. Moreover, one well-known type and arrangement of floats, &c., has been rather too obviously copied, line for line, in one or two instances. The qualifying test in this case, 15 seconds, is certainly not one that should have exercised any influence on originality. After having made the above criticisms, we have nothing but praise to bestow on the exhibits, which should do much to stimulate increased interest in this side of aeronautical work. Amongst them are, undoubtedly, some of the finest examples of workmanship which we have as yet seen, and which should be of the greatest value to the less experienced or less skilful workman, as setting a standard of excellence to which to strive to attain.

Club Exhibits.

Amongst the club exhibits, premier place is easily taken by the Kite and Model Aeroplane Association, whose exhibits alone would



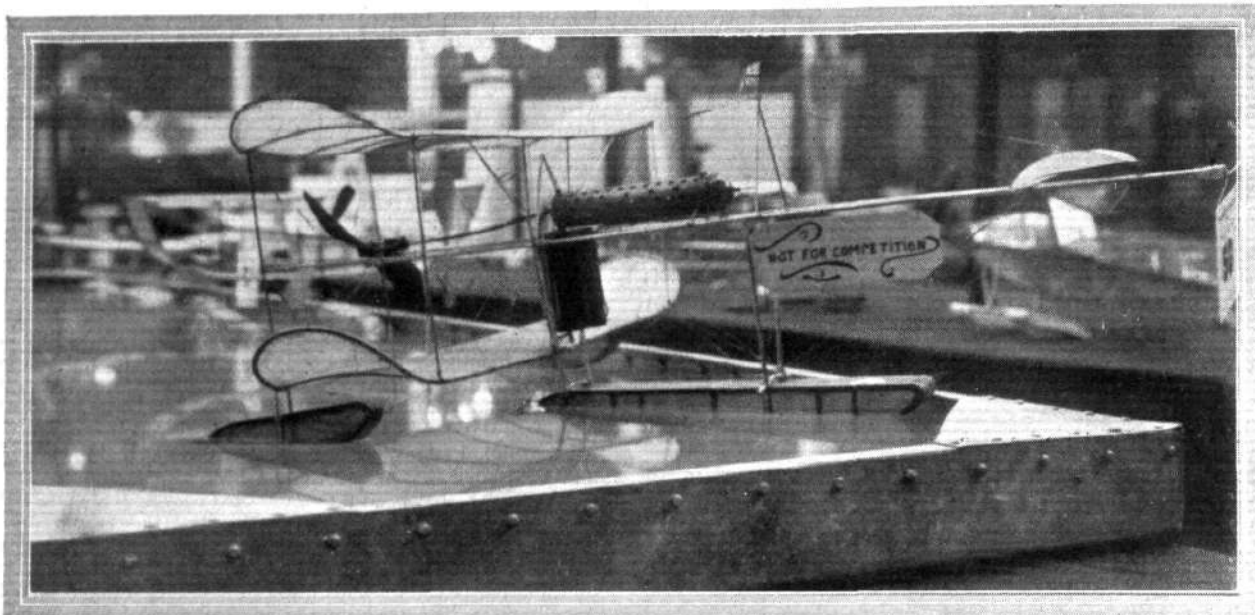
A corner of one of the Royal Aero Club's Model Section exhibits. In the background are seen the Caudron machines, the Porter helicopter, the Breguet monoplane, &c.

be sufficient to form a first-class exhibition. Their exhibits include some half-dozen practical power-driven models, besides rubber-driven ones of every type by the most expert professional and amateur aeromodellists of the day. Their exhibit should certainly be the means of them adding very considerably to their membership, and of helping forward the affiliation scheme, since it can only serve to show in the most marked manner their leading position in the model aviation world, were any such evidence necessary.

L'Essor Français.

This club—the only foreign one exhibiting—shows five models, two of which are power-driven, driven apparently by compressed air and fitted with (approx.) a 3 to 1 gear, one has a single compressed air cylinder, the other two the cylinder in each case serving to form the fuselage. The single-cylinder one is a Canard-type monoplane, the twin-cylinder a Canard-type biplane. There

good. Of the six self-rising models, four are tractors and two Canard type. F. Camm exhibits a tractor monoplane, single-propeller twin-gear, built up fuselage, laminated propeller. S. Camm, a hand launched biplane—Canard type—with staggered planes, with a slight negative angle at the tips, combined with swept back wings, built up fuselage and laminated twin propellers, also a monoplane on very similar lines. F. A. Dowsett, a biplane—tail type—twin propeller, rear fin and channelled section wood, triangulated chassis, extended upper plane. A. Eldridge, a tractor monoplane in which the propeller is unprotected by any skid. E. Stanbrook, a double surfaced tractor biplane, fitted with four-bladed propellers, built up covered in fuselage and rigid chassis, the skids are steel sprung and laminated. E. Vevers, a tractor, fitted with a single propeller, twin gear (*i.e.*, two cogs of the same number of teeth), spring chassis.



One of the model hydro-aeroplane tanks at Olympia Show.

"Flight" Copyright.

is also a similar type rubber-driven one—with twin gearing—one model with twin propellers, and a tractor with a single screw. As claims of half-mile flights have been made for compressed air motors of the above type, it will be extremely interesting to see what they can really accomplish in open competition. The design and workmanship of the French models does not, we are afraid, compare very favourably with that of their British rivals.

Windsor Model Aero Club

exhibits seven models, of which one alone is hand-launched. We feel that a special word of encouragement is due to this club, which is at present quite a small one and which, we learn, has not possessed the advantage of seeing any other model flying than their own. A very tasteful and pleasing effect is made in the case of their exhibit by their seven models all being covered with a similarly coloured fabric—in the case of small combined exhibits the effect is decidedly

KITE AND MODEL AEROPLANE ASSOCIATION.

Official Notices.

British Model Records.

Hand-launched	Distance	A. E. Woollard	477 yards.
	Duration	A. F. Houlberg	89 secs.
Off ground	Distance	G. Rowlands	232 yards.
	Duration	A. F. Houlberg	51 secs.
Hydro, off water	Duration	G. P. Bragg-Smith	25 secs.
Single-tractor screw,	Distance	F. G. Hindsley	173 yards.
hand-launched	Duration	F. G. Hindsley	36 secs.
Do., off ground	Duration	H. R. Weston	21 secs.

Aero Exhibition, Olympia.—The model exhibit which was organised by the R.A.C. and this Association has proved a great success, and has shown the public the progress of model work since the last exhibition, which the council thinks is entirely due to the high standard of the competitions organised by the Association.

"Model Engineer" Exhibition.—The *Model Engineer* Exhibition will be held at the Royal Horticultural Hall, Westminster, October 10th to October 18th inclusive. The aeronautical section will be organised by the Association.

Flying Trials in connection with Aero Show.—The trials for classes 1, 2A and 2B will take place at the London Aerodrome, Hendon, on Saturday, March 1st, commencing at 9 a.m. sharp. The trials for class 3, Hydro-aeroplanes, will take place at the Welsh Harp, Hendon, on Saturday, March 1st, at 3 o'clock sharp. All competitors not present at their positions at the times stated will be disqualified, and owing to the number of entries for the ground trials the time limit will be enforced, and the council hope that all competitors will help in getting their machines in flying order before the times, also all machines are to be submitted for weighing and inspection to the hon. sec. before taking up positions.

Paddington and District Aero Club.

This club exhibit seven models, of which six are rise off the ground, five of these are tractors, gearing being used in two cases. These models show very considerable improvement both in design and workmanship, and the exhibit does the club decided credit. T. Carter exhibits a twin-propeller self-rising Canard-type model; C. C. Dutton a tractor monoplane, twin-gear propeller, fitted with a central tubular rod of walnut veneer; W. E. Evans a four-bladed monoplane tractor, 3 ft. 6 ins. long, and of the same span; M. Levy a single-screw tractor monoplane, fitted with a long skid and triangulated fuselage, and having a central opening in both the main plane and the tail; H. Weston a tractor monoplane; S. Wood a model fitted with a biplane elevator, a very low centre of thrust, upturned wing tips and twin-propellers; H. Woolley a tractor biplane, twin-gear propeller.

Luncheon.—All members wishing to have lunch provided at the Welsh Harp between the land and the water trials should at once notify the hon. sec. of the number of their party requiring same provided, to save disappointment 27, Victory Road, Wimbledon, S.W. W. H. AKEHURST, Hon. Sec.

MODEL CLUB DIARY AND REPORTS.

CLUB reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Leytonstone and District Aero Club (64, LEYSPRING ROAD).

MEMBERS are notified that club model flying will re-start on Sunday, Feb. 23rd, at 9.30 a.m., near Bushwood Avenues, also that models exhibited at Olympia may be taken away after 10 p.m. on Saturday, Feb. 22nd.

Paddington and Districts (77, SWINDERBY ROAD, WEMBLEY).

FEB. 22ND.—Tractor competitions, duration and distance. Hand launched and rise off ground.

Reigate, Redhill and District (8, BRIGHTON ROAD, REDHILL).

FEB. 22ND.—Club visits Olympia.

S. Eastern Model Ae.C. (1, RAILWAY APPROACH, BROCKLEY).

NEXT week-end flying as follows: Blackheath and East Dulwich branches: Feb. 22nd, Kidbrooke, 2.30 to 5.30 p.m.; Feb. 23rd, Blackheath, 7.30 to 10 a.m.; Feb. 23rd, Lee, 10.15 a.m. to 12.15 p.m. Croydon and Beckenham branches: Feb. 22nd, Duppas Hill, 2.30 to 5.30 p.m.; Feb. 23rd, Mitcham Common, 2.30 to 5.30 p.m.

CORRESPONDENCE.

* * The name and address of the writer (not necessarily for publication) MUST in all cases accompany letters intended for insertion, or containing queries.

Correspondents communicating with regard to letters which have appeared in FLIGHT, would much facilitate ready reference by quoting the number of each letter.

Aeroplane Engines and R.A.F. Tests.

[1726] It may be useful that constructors of engines intended for aeronautical purposes should be informed that I am prepared to test at the R.A.F. any suitable engines. An impression having arisen, perhaps from the terms of the Alexander Prize Competition, that such engines must be submitted to a 24 hours' full load test in order to be considered, I beg that you will assist in removing this impression. It is a goal to be aimed at that such an engine shall be capable of running without overhaul for a total of 24 hours, and it is to be appreciated that aeroplane conditions involve running up somewhere about full load during the major part of flying—differing in this from normal motor car conditions.

Builders of aeronautical engines are invited, and all facilities will be given to them, to demonstrate their engines by test at the R.A.F. Petrol, oil, and labour will be provided without cost, and the test bench appliances will be put at their disposal, subject only to the presence of a skilled mechanic to represent the firm putting forward their engine, and under the firm's responsibility for the test and any damage or accident which may occur in connection with the test.

It is useful to secure that the weight shall not exceed 4 or 5 lbs. per brake h.p., and the brake h.p. in question is that h.p. which the engine will develop as useful h.p. on a 5 hours' test.

It is as well that designers should realise that propellers of usual diameter run at from 900 to 1,200 r.p.m. according to the engine, and at normal full load, and that when a speed as low as 900 r.p.m. is given it is obtained by gearing down to the propeller shaft (naturally weight allowance is claimable for this).

One of a type of the engines now in use has in most cases (*viz.*, one British and three foreign) been run from 20 to 24 hours without mechanical damage or overhaul and without compulsory stop.

I can provide a wind-tunnel over the brake instrument, giving about 30 r.p.m. wind, or alternatively the engine may be submitted with a screw or fan such that it affords its own cooling.

Where an air screw is used to develop the h.p. r.p.m., it will be necessary that it shall be handed over to be calibrated, and so obtain a measure of the power consumed by such screw. Fuel and oil consumption will be measured.

Any further particulars will be given on request, and a statement of the performance, weight, h.p., speed, endurance, consumption, which is claimed is invited, whether or not the above desiderata are reached.

MERVYN O'GORMAN.
Supt. R.A.F.

The Wulffing Airship.

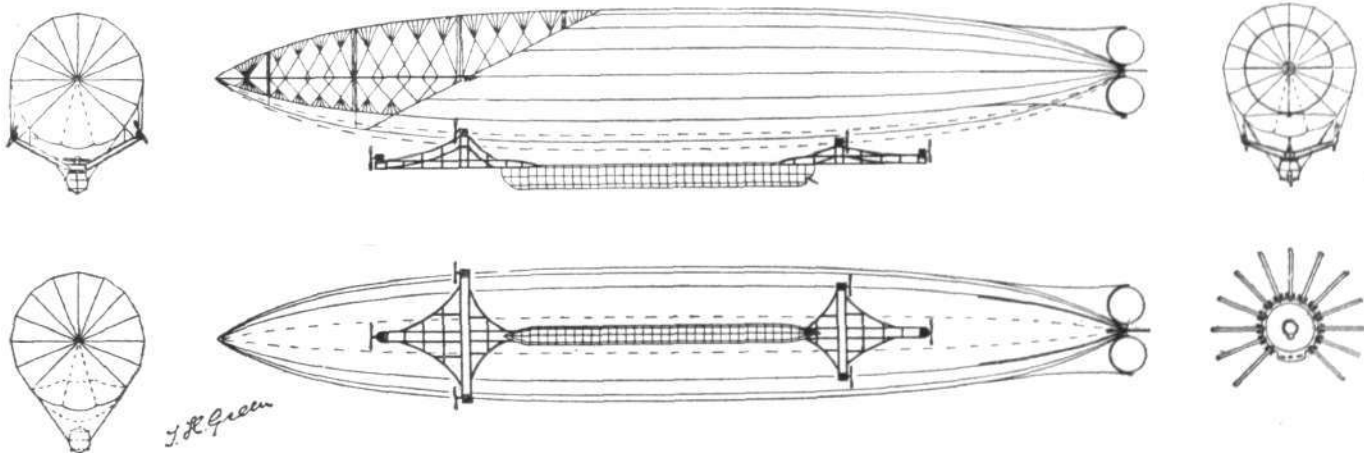
[1727] In view of the apathy of the Government and the English nation in general to airship matters, chiefly owing to the non-existence of any (apart from the small Army dirigibles), I beg to place before your readers some particulars relating to an airship with several unique features, patented in this country by Mr. Wulffing, a German engineer.

Essentially Mr. Wulffing employs a rigid form of construction. This, however, is of a modified nature, which is such as to combine the advantages of the rigid system with those of the non-rigid type. The hull is built up on a skeleton of steel tubes; these steel tubes can be made exceedingly light, and can be built either fusiform or fish shaped hull as desired. The steel tubes converge at the bow and stern, where they are joined together by a metal nose-piece and tail-piece. The steel cable running horizontally from bow to stern knits the whole structure firmly together, and renders it absolutely rigid. The skeleton thus formed is covered with an outer covering of fabric; within the lifting gas is contained either in a single envelope—which may be separated by partitions—or in a series of interior balloons. The base of the hull is left flexible by the omission of two or more steel tubes that would normally occupy this position; the latter are replaced by elastic strands, thus when the gas expands owing to a decrease in the atmospheric pressure or increased temperature, this elastic portion of the envelope will be distended, thus preventing the loss of gas which would otherwise take place. The engines are six in number, and are mounted in two sets of three, one engine being mounted at the bow with two engines immediately in its rear, carried on outriggers extending upwards to either side of the hull; a similar arrangement, but in reversed order, is adopted for the rear motors; each set of engines is mounted on a separate girder platform. The passenger car, completely covered in, is situated between the two motor platforms, and works in a ball-race at either end, so that the shock of landing is thrown neither on to the rigid car nor on to the power plant when resting on the ground or on the water, for which also it is provided. In flight the motor platforms and car are locked rigid; the propellers are well clear of the surface; these engines work independently, and the propeller in each case is mounted direct, thus saving any loss due to transmission.

The following form the main features of the dirigible under consideration: Length, 325 ft.; master diameter, 50 ft.; average diameter, 35 ft.; capacity, 350,000 cubic ft.; gross lifting power, 11 tons; total weight, including engines, car, &c., 6 tons; net lifting power, 5 tons. As the total lift amounts to 24,640 lbs., the net lifting power amounts to 11,200 lbs., or about 50 per cent.; the best Zeppelins have only about 30 per cent.

I enclose two drawings, one in reference to the above description, the second is to do with a smaller ship (44 by 279 ft.), which it is thought would be better to start building on account of it costing less money, which for this purpose is hard enough in England to get; but constructionally both are exactly the same.

The advantages of the Wulffing airship over the Zeppelin are: This airship is absolutely rigid, but the construction is so light that if, for instance, we build a ship of the same cubic capacity as the Zeppelin we have double the size of car for passengers, and 50 per cent. more motor power; still 80 to 100 per cent. more net lifting power than the Zeppelin. The higher motor power enables us to obtain greater speed (by a size equal to the Zeppelin) of 60 to 70 miles per hour. The higher net lifting power enables us in time of war to take in more petrol for longer acting radius; quick-firing guns with plenty of ammunition, and an additional platform



2 The principal feature of the Wulffing dirigible lies in the construction of the gas-containing hull; he has abandoned the lattice girder type of framework, and has obtained his increased lifting power principally in this direction.

above the aerostat for observation purposes, and quick-firing gun; larger crew, wireless telegraphy, &c.; and for private use good income can be earned by passenger carrying, of which a good number could be taken, about double the amount of the Zeppelin;

